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NOTES
ON
MATERIA MEDICA

PHARMACOLOGY AND THERAPEUTICS
FOR
DENTAL STUDENTS AND PRACTITIONERS.

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PREFACE.

THESE "Notes" were originally designed for the use of students proceeding to the examination for the L.D.S. England. It is hoped, however, that they may also prove of some service to the dental practitioner.

It need hardly be said that this volume does not claim to be a complete treatise upon the so-called Dental Materia Medica, nor, indeed, anything more than an attempt to set down as briefly and in as practical a manner as possible, those properties, actions, and applications of drugs which are of utility or interest to the dental surgeon.

For this reason any description of the *general* therapeutic action of drugs has been omitted, except in cases where it has been considered that such therapeutic action approaches nearly to the border-line which, for the sake of convenience, divides dental from general medical practice. Of many drugs which find a place in larger works on the subject all description has been left out, either from their doubtful utility or from a desire to avoid confusion, which would be caused by multiplying descriptions of those having an identical action. Other drugs have been inserted with a view either of completing the classification of pharmacological groups, or their

properties described as a warning against their employment save by the qualified physician. It will be noted that in many instances in Part II. all *Materia Medica*, doses, and prescriptions have been purposely omitted.

It has seemed to the Authors that on the whole the pharmacological classification of drugs is the most practical one for the dentist, and this has accordingly been adopted, though open to the objection that it involves a good deal of cross-reference, and a certain amount of unavoidable repetition.

The thanks of the Authors are due to Mr. W. F. Mellersh and Mr. Harvey Hilliard for kind assistance with the sections on Bleaching and General Anæsthetics respectively.

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INTRODUCTION.

Therapeutics. (Θεραπεύω, I attend, treat.)

The science relating to treatment of disease by remedial measures.

Therapeutic measures are conveniently divided into :—

1. Surgical.
2. Medical.

Though there is no hard and fast line to be drawn between the two. Medical therapeutics include not only treatment by drugs, but also by varied means, such as diet, climate, electricity, etc.

Dental therapeutics are mainly of a surgical nature, though drugs are of such use as to be indispensable.

The dentist, no less than the general physician or surgeon, should consider it his highest aim to guard against disease by the adoption of preventive and hygienic measures rather than to effect cures. See also p. 167.

Pharmacology. (Φάρμακον, a drug.)

The science which deals with the action of medicines upon healthy and diseased tissues.

Drugs or medicines are employed in dentistry :—

1. COMMONLY.

- a.* For direct action on living tissues in the mouth.

Example.—Arsenic used to destroy vitality of pulp.

- b.* For direct action on germs or micro-organisms.

Example.—Creosote used to disinfect foul roots.

c. Action on products of decomposition.

Example.—Permanganate of potash mouth-wash after extraction of teeth.

d. For their purely physical action.

Example.—Chloroform to act as a solvent of gutta-percha used in root filling.

2. FREQUENTLY.

For general constitutional effects ; such as production of general anæsthesia, and treatment of untoward symptoms that may arise in the consulting-room.

Example.—Sal volatile in the treatment of syncope.

3. MORE RARELY.

For indirect action upon morbid states of the mouth or teeth, the primary effect being produced in some other part of the body.

Example.—Administration of a purgative in cases of acute periosteal inflammation.

Although the majority of drugs employed in dental practice are made use of for their local rather than for their general effect, constitutional symptoms may be produced accidentally (idiosyncrasy to particular drug, accidental poisoning). Therefore it is important to be acquainted with the pharmacological action of the drugs employed.

Note.—That the same drugs may have different action when employed in different strengths or doses.

Toxicology. (τοξίκον, arrow-poison.)

The science which treats of poisons and their antidotes.

Some drugs which are not poisonous in ordinary doses are poisonous when administered in large doses.

Example.—Chlorate of potash.

Others, again, are not rapidly eliminated, and frequent small doses may accumulate in the body and so cause poisoning.

Example.—Mercury, Lead.

The dentist should be acquainted with the possibly poisonous properties of all the drugs he employs, as a preventive against accidents. Also with the appropriate antidotes and remedies, that should an accident unfortunately occur, he may be able to furnish assistance without loss of time.

All bottles, boxes, or packets containing drugs should be labelled at once, and in the case of poisonous drugs **POISON** should be clearly written on each.

Materia Medica.

The substances or materials used in medical treatment, their names, sources, characters, and properties, and the doses in which they should be administered.

In dentistry, no less than in general medicine, an acquaintance with at least the important characters and properties of the drugs employed is essential. Thus may be avoided the disappointment caused by an old solution of cocaine, or the attempt to disinfect steel instruments with a solution of perchloride of mercury.

Pharmacy. (Φάρμακευτική.)

The art of

- (i) Making preparations from crude materials.
- (ii) Dispensing prescriptions.

The details of practical pharmacy do not concern the dentist, though a knowledge of terms is advisable. Remedies of unknown composition should be rejected.

Pharmacopœia. (Φάρμακον, and ποιέω, I make.)

A standard list of drugs and their preparations. It is published by Government authority. Drugs

and preparations of this list are termed "official." The maximum doses that should be employed and the minimum doses likely to be of effect are indicated in the B.P., which also contains much information to the pharmacist.

By means of the "Pharmacopœia" uniformity and standardisation are obtained, and a valuable means of communication established between the prescriber and the chemist, as all "official" drugs and their preparations have to be dispensed in accordance with "Pharmacopœia" standards.

When it is desired to employ non-official preparations (and these are frequently useful) their nature must be clearly indicated in the prescription where any doubt exists. (Example: Tr. Aconiti (Fleming), a non-official preparation 12 times as strong as the Tr. Aconiti of the B.P.).

Remember that in foreign countries, where patients may require their prescriptions dispensed, there are other "Pharmacopœias" differing from the British.

Pharmaceutical Preparations.

Some drugs, chiefly inorganic, are employed in their natural state, or as substances of definite chemical composition.

Example.—Perchloride of mercury, oil of cloves. .

Others are commonly used in the form of preparations of various kinds, such as:—

Aquae (waters) and *Liquores* (solutions), substances dissolved in water.

In the U. S. P. "Liquors" correspond to the "Aquae" of the B. P.

Injectiones Hypodermicæ (hypodermic injections), solutions of an active drug for administration under the skin by means of a syringe and needle.

Mucilagines. Aqueous solutions of gummy substances.

Glycerini. Solutions of substances in glycerine.
(U. S. P., "Glycerita.")

Tincturae (tinctures). Alcoholic solutions.

Trochisci (lozenges). Dried tablets of sugar, gum, or a fruit base, mucilage and one or more active ingredients.

Pulveres (powders).

Emplastra (plasters).

And very many others, concerning which, and the details of these, a larger work must be consulted, as they possess little interest for the dental practitioner.

Weights and Measures in Common Use:

I. The Imperial System.

In prescribing, the symbols or abbreviations are frequently used.

Weights.

The grain (granum), gr.

The drachm (drachma) = 60 grains. ʒ.

The ounce (uncia) = 437.5 grains. ℥.

The pound (libra) = 16 ounces. lb.

A 20-grain weight called the scruple, ℥, is now generally discarded.

Note that the drachm (a non-official weight) is **not** strictly the 8th part of an ounce as in the fluid measure.

Measures.

The minim (minimum), min. or m.

The fluid drachm = 60 minims, fl. dr. or f̄3.

The fluid ounce = 8 fluid drachms, fl. oz. or f̄3̄.

The Pint (octarium) = 20 fluid ounces, O.

The Gallon (congius) = 8 pints, C.

Convenient Domestic Measures.

Not, however, to be employed where accuracy is desirable.

1 drop = (very roughly) 1 minim.

1 teaspoonful = (roughly) 1 fluid drachm.

1 tablespoonful = (roughly) $\frac{1}{2}$ a fluid ounce.

1 tumblerful = 10 to 12 fluid ounces.

Table of Percentage Solutions.

Per-centage.	1 fluid drachm.	1 fluid ounce.	1 pint.	Parts.
1.	gr. 0·547	gr. 4·375	gr. 87·5	1 in 100.
2.	gr. 1·094	gr. 8·750	gr. 175·0	1 in 50.
3.	gr. 1·640	gr. 13·125	gr. 262·5	1 in 33·33.
4.	gr. 2·187	gr. 17·500	gr. 350·0	1 in 25.
5.	gr. 2·734	gr. 21·875	gr. 437·5	1 in 20.
6.	gr. 3·281	gr. 26·250	gr. 525·0	1 in 16·66.
7.	gr. 3·828	gr. 30·625	gr. 612·5	1 in 14·28.
8.	gr. 4·375	gr. 35·000	gr. 700·0	1 in 12·5.
9.	gr. 4·922	gr. 39·375	gr. 787·5	1 in 11·11.
10.	gr. 5·468	gr. 43·750	gr. 875·0	1 in 10.

II. The Metric or Decimal System.

Is now official as well as the Imperial, but is not as yet in common use in prescribing (though exclusively used for pharmacæutical testing), so is not given here.

On the Continent of Europe the metric system is the only official one; all liquids, as well as solids, are weighed, and the weight expressed in grammes.

Relation between Imperial and Metric Systems.

A few relations easy to remember, but **approximate** only :—

1 cub. centim.	= m. xvij.	or 16.9
4 cub. centim.	= f. 3 j.	
30 cub. centim.	= f. 3 j.	
gr. j	= 65 milligrams.	
gr. jss	= 10 centigrams.	
gr. lx	= 4 grammes.	
5 j. (avoirdupois)	= 30 grammes.	
lb. j	= $\frac{1}{2}$ kilogramme.	

gr xv = 1 gramme

PRESCRIBING.

The art of selecting remedies and ordering them (either alone or in suitable combination) for the treatment of diseases. Usually embodied in a recognised written form called a prescription.

The dentist is frequently called upon to prescribe a suitable mouth-wash (collutorium) or dentifrice, and other local applications. Less frequently to order a purgative, gargle, or anti-neuralgic remedy. As a general rule, however, administration of internal remedies is best left to medical practitioners.

Points to be considered in prescribing.

i. Selection of the remedy or remedies most appropriate to the case it is desired to treat when several are available.

This is an important test, not only of pharmacological knowledge, but also of the disease to be treated.

Example.—In prescribing a mouth-wash the dentist should consider such points as whether it is specially required to deodorise the breath, exercise an astringent action on the mouth, act as an ant-acid, etc., and select the drugs accordingly.

INTRODUCTION.

ii. Consider what preparations of the remedy it is most desirable to employ.

Example.—In prescribing **Chlorate of Potash** as a remedy for stomatitis, it may be used in simple aqueous solution, as part of a mixture, or as a lozenge.

iii. Consider mode of administration.

Example.—Mercury given for the cure of syphilis may be administered by the mouth, by inunction, by fumigation, or by intra-venous or intra-muscular injection, and in any of these ways produce constitutional effects.

iv. Consider strength in which it is desirable to employ remedy.

If for internal administration, the suitable dose.

As stated above, the Pharmacopœia indicates the limits of ordinary doses.

The dose of a drug administered by hypodermic injection must invariably be a smaller one than when given by the mouth (*see also* p. 175).

A useful method of reckoning doses for children under 12 is to divide the age in years by the age in years + 12, and use the result as the fraction of an adult dose that should be given. Thus for a child

of 8 the dose will be $\frac{8}{8+12} = \frac{2}{5}$ of an adult dose.

Above 12 and under 21, give between $\frac{1}{2}$ and a full dose. Other conditions besides age modify doses, such as idiosyncrasy, habit, and disease, but the question is too general to be discussed here.

v. Consider frequency with which it is desirable that the remedy should be used.

Example.—Morning and evening (*nocte manequē*). Every four hours (*quartis horis*). Three times a day (*ter die*). Occasionally (*pro re nata*).

vi. Consider duration of period over which it is desirable that treatment should extend.

Example.—Harm may be done by too long application of strong lotions to the mucous membrane of the mouth.

vii. Consider suitable combinations where more than one drug has to be used at the same time.

Each constituent of a prescription may be used to have a different effect, or the same effect, though in the latter connection be careful not to "overdo" matters by prescribing (for example) a dozen different antiseptics in the same mouth-wash.

Remember that the appearance and taste of mixtures are worthy of consideration.

viii. Avoid combining drugs which are chemically or physiologically incompatible.

It is as well to bear in mind, though unlikely to occur in the dental practitioner's limited *materia medica*, that some drugs act on each other chemically, producing inert substances, poisonous compounds, or explosive mixtures.

Example.—Permanganate of potash or chlorate of potash, being rich in oxygen, should not be mixed with readily oxidisable substances, such as charcoal, carbolic acid, or glycerine.

Prescriptions are written as follows:—

I. IN LATIN.

1st. The **Superscription**, which is the sign *R*, now used as an abbreviation for "Recipe" (*Take of*), though originally it was a sign for invocation to Jupiter.

2nd. The **Transcription**, consisting of the names of drugs in the genitive case, and their doses in the accusative. It is more correct to write the name of the *vehicle* in the accusative when followed by "ad."

3rd. The **Subscription**, or direction to the dispenser written in Latin.

4th. The **Signature**, or directions to the patient ; usually written in English.

5th. The prescriber's initials or name, and the date.

The name of the patient should also be written either above or below the prescription, to one side.

Example :—

Patient's name.

Miss E. Smith.

Superscription. **Rx.**

Transcription. *Liquoris Ferri Perchloridi* m. ij.
Potassii Chloratis gr. iij.
Aquam Aurantii ad 3 j.

Subscription. **Misce. Fiat mistura.**
Mitte doses tales viij.
 (or **Mitte** 3 j).

Signature. **Signa.** One teaspoonful to be taken three times a day after meals.

Name and date. **A. Brown** 1/ 6/ '05.

Or abbreviations may be used, thus :—

Liq. Ferr. Perchlor. m. ij.
Potass. Chlorat. gr. iij.
Aq. Aurant. ad 3 j.

M. ft. mist. Mitte dos. viij.

Sig. (or S.). One teaspoonful to be taken three times a day after meals.

A. B. 1/ 6/ '05.

s. or ss. used as abbreviation for semis, a half, and āā for ana, of each.

Remember never to use abbreviations which are ambiguous, such as *Ac. Hydroc.* (which may mean *Hydrocyanic* or *Hydrochloric*) ; *Hyd. Chlor.* (which may mean *Calomel*, *Corrosive Sublimate*, or *Chloral Hydrate*).

II. IN ENGLISH.

This is less usual, but is best adopted when there is doubt as to the correct Latin to employ.

Example:—

Miss E. Smith.

Take of (or R).

<i>Solution of Perchloride</i>	
<i>of Iron</i>	2 minims.
<i>Chlorate of Potassium</i>	3 grains.
<i>Orange water to</i>	1 fluid drachm.

Dissolve and mix. Send 8 doses.

Mark the bottle. One teaspoonful to be taken three times a day after meals.

A. B. 1/ 6/ '05.

Avoid writing "hybrid" prescriptions, half in Latin and half in English, and be always careful to add the "Subscription" and "Signature."

When composing a prescription write down all the ingredients first, and add the quantities afterwards. This method will frequently save subsequent erasure.

PART I.

CAUSTICS.

Caustics (*καίω*, I burn) are substances which burn, corrode, or disintegrate the tissues.

Caustics may act by physical means, such as light, radio-activity, electricity, the actual cautery, or by withdrawing water from the tissues, as strong acids and alkalies. Or by chemical means, as with certain metallic salts. Or, again, by causing inflammatory necrosis, as with some of the volatile organic irritants, such as chloroform and carbolic acid.

Caustics are also disinfectants, as they destroy the protoplasm of germs, but their use for this purpose in living tissues is to be as far as possible avoided, because :—

1. Whilst destroying the germs they also destroy the tissues, and so break down the natural means of resistance and repair.
2. By producing a slough they form a very favourable nidus for the further growth of any new germs which may arrive.

Caustic hæmostatics are open to the same objections.

In the case of spreading infective inflammatory diseases (*e.g.*, *cancrem oris*), where the tissues are unable to cope with the germs, and in the case of small follicular ulcers, caustics are of use in destroying the diseased tissues and the disease at the same time, and allowing the healing process to start afresh.

For the destruction of new growths and polypi of the gum, caustics are very inferior to the knife, because :—

1. It is difficult to accurately control the amount of tissue acted upon.
2. A mass of dead tissue is left behind which is very likely to become septic and set up inflammation and secondary hæmorrhage.

Caustics should therefore never be employed to remove epulides, but for the removal of polypi of the gum they have the advantage that they can more readily reach the part, and cause less immediate hæmorrhage.

Caustics, by destroying the vitality of dentinal fibrils, can prevent the transmission of sensation, and thus act as obtundents. Their employment in this capacity is not, however, free from risk of irritation or death of the pulp.

In the selection of a caustic the following points should be considered :—

1. The method of its action.
2. The depth to which it will penetrate.
3. The amount of pain it will cause.
4. The probability of keeping the slough aseptic.
5. Any staining action that may occur.

For the destruction of the dental pulp, without an anaesthetic, chemical caustics are usually the least painful method.

The degree of penetration of a caustic will depend upon :—

1. Its volatility and solubility.
2. Its power of absorbing water from the tissues.

3. Whether it produces a coagulum or not; and, in the former case, the solubility of the coagulum.
4. Whether it becomes chemically united to the tissues, and so neutralised, or not.
5. The density of the tissue.

The caustic action of drugs employed for other purposes should always be borne in mind and care exercised, lest they do more harm than good.

The following drugs, employed in dentistry for other purposes, have a caustic action:—Permanganate of potash, ferric chloride, dried alum, kalium-natrium, strong sol. of hydrogen peroxide, sodium peroxide, chlorine, iodine; sulphuric, chromic, trichloroacetic and phosphoric acids; ammonia; chloroform, formaline, salicylic acid. Also such means as extreme cold produced by the evaporation of drugs, excessive or wrongly applied electric currents used for cataphoresis or ionic medication, and prolonged X-ray exposures.

Acidum Arseniosum. ARSENIOS ACID (As_2O_3).

Materia Medica.

Synonyms. Arsenic, arsenious acid, white arsenic.
Arsenious anhydride, arsenious oxide.
Arseni trioxidum.

Crude arsenic containing cobalt in combination and known as *cobalt*, acts by the arsenic it contains and is liable to stain the tooth.

Characters. A heavy white powder, or in crystalline masses. Odourless and tasteless.

Solubility.

1 in 100 of cold water,
1 „ 500 „ alcohol,
1 „ 8 „ glycerine,
1 „ 11 „ liquor potassae.

Incompatibles. Salts of iron, magnesia, lime water, astringent matters.

Dose. $\frac{1}{60}$ to $\frac{1}{15}$ gr.

Pharmacology.**CAUSTIC, ANTISEPTIC, TONIC, SPECIFIC,
ANTI-PERIODIC.**

CAUSTIC. Applied to a healthy tooth pulp it causes dilatation and increased permeability of the capillaries, death, and fatty degeneration of the cells and nerves. It does not cause coagulation of the tissues, nor chemically combine with them; hence penetration is very deep, but slow. If applied to a congested and septic pulp it sets up acute inflammation, and the resulting exudation causes such pressure on the apical vessels, affecting principally the thin walled veins, that circulation is stopped and death *en masse* of the pulp results.

Arsenic applied in the form of a paste to an ulcer on the skin, and carefully covered over, causes acute inflammation and dry gangrene, the part separating in three or four weeks as a mummified slough, and usually leaving a cicatrix. This limitation of action by the formation of a cicatrix appears to explain why large applications of arsenic to the pulp, or an application to an inflamed pulp, is not so effectual as a small application to a normal pulp; and also those rare cases in which the pulp appears entirely refractory to the action of the drug.

ANTISEPTIC. Arsenic is antiseptic in the strength of 1 in 16.

TONIC. No use is made of this property in dentistry.

SPECIFIC. In the treatment of syphilis (*see* p. 174).

Therapeutics.

CAUSTIC. Arsenic is used to destroy the dental pulp.

It must be carefully applied :—

1. Place in **contact** with the pulp tissue, or its action will be slower and may reach the periosteum before it has killed the pulp.

Arsenic is able to penetrate through a thick layer of dentine.

2. Apply it **without pressure**, so that the pulp may expand a little during the first action of the drug without pain.
3. Seal it in, to be **water-tight**, or else some may escape on to the gum, where, if not quickly washed away by the saliva, it will destroy the gum and even the alveolus also if left long enough.

*Dialysed
iron.*

In the latter event, the treatment is to remove the dressing and all dead tissue, wash away the arsenic with jets of **warm water**, then neatly fill the tooth cavity, leaving no overlap, and prescribe an **antiseptic mouth-wash**.

One-sixteenth of a grain of arsenic is enough to kill a pulp in about 48 hours; more should not be used, and it is unwise to leave a dressing much longer.

Some people are very susceptible to the action of arsenic, even in small doses.

If a large dressing is left in a tooth for a long time, it will penetrate the dentine and destroy the periosteum, causing the tooth to loosen and fall out.

To relieve the pain caused by a properly applied arsenic dressing, **Iodine** solution may be applied to the gum and **5 grs.** of **Phenacetin** administered internally every hour for three hours.

Arsenic is the active ingredient of "**Devitalising Fibre**" and "**Paste**," formulæ for which are:—

R.

<i>Arsenious acid</i>	gr. 5
<i>Tannin</i>	gr. 2
<i>Acetate of morphine</i>	gr. 10
<i>Carbolic acid enough to make a thin paste.</i>	
<i>Absorbent cotton-wool, finely cross cut, q.s.</i>	

Mix the paste with the cotton-wool and allow to dry.

R.

<i>Arsenious acid</i>	2 parts
<i>Acetate of morphine</i>	1 part
<i>Creosote to make a stiff paste.</i>	

A quantity the size of a pin's head is enough to destroy the pulp. †

Pulp stones, such as are often found in the pulps of young gouty subjects, arrest the action of arsenic and cause violent pain, possibly by the swelling above pressing the pulp stone into the pulp below. In such cases it is better to administer an anæsthetic and remove the obstruction.

Whilst the roots are incomplete an arsenical dressing must not be left in the tooth for more than 12 hours, and the avoidance of its use at all is to be desired.

Absorption starts in the roots of temporary centrals and laterals soon after their completion, so that it is never safe to depend on these roots being complete; the canines are complete from about the 5th to the 8th year; the first molars from about the 5th to the 7th year; the second molars from the 6th to the 8th year; the permanent teeth have their roots completed about three years after their eruption.

The caustic action of arsenic may be employed as an obtundent of sensitive dentine in very shallow cavities. It must not be left in contact with the tooth for more than two hours, and the carious dentine must then be very fully removed. It is very effective, but very dangerous to the pulp. It acts by destroying the vitality of the dentinal fibrils without coagulating them, hence the dangerous depth of penetration.

ANTISEPTIC. The antiseptic action of arsenic will tend to prevent putrefactive changes in the pulp after its destruction, but it is not powerful enough to be relied on to disinfect an already infected pulp.

After devitalisation by arsenic, the application of a dressing of **tannin and carbolic** will, in a few days, render the pulp harder and more easy of removal; it will also help to prevent putrefaction, and hasten the death of a half-dead pulp.

Toxicology.

2 grs. (0.130 gm.) of arsenic have killed a man.

From external applications arsenic may be absorbed and cause poisoning.

Symptoms of acute poisoning.

Intense burning pain in throat and stomach.

Faintness, nausea, sickness.

Thirst, vomiting, purging.

Restlessness, cramp, collapse.

Treatment.

Wash out the stomach, or give an emetic.

Ferric hydrate (1 oz. of *Tr. ferri perchlor.* and

1 oz. of washing *soda* in water).

Brandy and morphine.

Zinci Chloridum. ZINC CHLORIDE. ZnCl_2 .**Materia Medica.**

Dose. Not given internally.

Characters. A white, granular, odourless, intensely caustic, deliquescent powder, or translucent stick.

Solubility.

10 in 4 of water,

1 „ 1 „ alcohol,

1 „ 4 „ glycerine,

freely in ether.

Incompatibles. Lime water, alkalies and their carbonates, tannin.

Preparations. *Liquor Zinci Chloridi* (80%).

Pharmacology.

CAUSTIC, ANTISEPTIC, DISINFECTANT,
ASTRINGENT.

CAUSTIC. Zinc chloride belongs to the class of caustic **metallic salts**, which act by the metal coagulating and entering into chemical union with the tissues to form an albuminate; the acid radicle, being liberated, also acts on the tissues as an acid, in addition to which chemical actions there will be the physical effect of the solution setting up osmotic currents, and so affecting the structure of the cells.

In this particular salt the zinc combines with the tissues to form an albuminate, which is slightly soluble; the acid radicle is a powerful acting one; all of which, combined with the ready solubility of the salt itself, make it a powerful and penetrating caustic.

ANTISEPTIC AND DISINFECTANT. See p. 71.

ASTRINGENT. See p. 39.

Therapeutics.

CAUSTIC. Zinc chloride is used to **reduce the sensitiveness of dentine**, especially the shallow cavities on the necks of the front teeth. It is applied to the dried tooth in the form of the solid salt and allowed to deliquesce. It causes severe pain at first, and care must also be taken to prevent it running over the gum. It soon reduces the sensibility of the dentine, but does not penetrate very deeply, and may have to be reapplied several times to entirely remove sensation.

As an ingredient in the **Oxychloride of Zinc** cement it was formerly used to reduce the sensibility of deeper cavities, but was a somewhat heroic form of treatment.

ANTISEPTIC. See p. 71.

Toxicology.

6 grs. have killed a man.

Symptoms of poisoning.

The same as with mineral acids. See p. 23.

Treatment.

It usually causes vomiting itself.

Give albumin (white of egg or milk) and soda.

Morphine and brandy.

Argenti Nitras. SILVER NITRATE. AgNO_3 .**Materia Medica.**

Synonym. Lunar caustic.

Dose. $\frac{1}{8}$ to $\frac{1}{3}$ gr. (diluted).

Solubility. 2 in 1 of water,
1 „ 18 „, alcohol.

Incompatibles. Alkalies and their carbonates (hard water), all bromides, chlorides, iodides and phosphates, solutions of arsenic and tannin, alkaloids ; bright light, amalgam fillings.

Pharmacology.

CAUSTIC, ASTRINGENT, STIMULANT, ANTISEPTIC,
DISINFECTANT. STYPTIC.

CAUSTIC. Acts in a similar way to zinc chloride. The silver quickly combines with the tissues to form an insoluble albuminate, which limits the penetration to a very superficial layer. Light, and certain substances, are able to precipitate the silver from its solution into the crevices of animal tissue, thus producing the permanent black stain.

ASTRINGENT AND STIMULANT. See p. 39.

ANTISEPTIC AND DISINFECTANT. See p. 70.

STYPTIC. See p. 54.

Therapeutics.

CAUSTIC. The caustic action of silver nitrate is principally of use in destroying the dentinal fibrils, and so obtunding sensitive dentine. It does not penetrate deeply. It is more effectual and less painful in its action than zinc chloride, but, unfortunately, stains the dentine a permanent black. Dentine so stained and exposed to the free cleansing action of the tongue and tooth-brush is less liable to decay.

Silver nitrate may be used to destroy the sensitiveness of an exposed pulp where arsenic is contra-indicated, but its action, though painless, is very shallow on account of the barrier of coagulated albumen it produces.

The caustic and disinfectant action of silver nitrate may be usefully employed in the destruction of single **follicular ulcers** of the gum. It is only necessary to touch the ulcer lightly after washing away the *débris* over it with a swab of cotton-wool. The effect is to destroy the germs and superficial tissues, and form an antiseptic protective scab over the wound, also to constrict the vessels and stimulate the tissues beneath.

Silver nitrate must never be applied in the solid form about the mouth without being first firmly fused to a piece of silver or platinum wire. Crystals must never be held in the dressing forceps, or an ordinary holder employed. A very small quantity of powdered silver nitrate may be sealed into a cavity with a temporary filling. The tooth will be badly stained.

A case is recorded of a small portion of silver nitrate escaping from the surgeon's hold, and lodging in the larynx, from a sudden movement of the patient. Death resulted from oedema glottidis.

ASTRINGENT AND STIMULANT. See p. 39.

ANTISEPTIC AND DISINFECTANT. See p. 70.

Toxicology.

50 grains have killed a man.

Symptoms of poisoning.

Pain in the œsophagus and stomach.

Vomiting, purging.

Cramp, collapse.

Treatment.

Wash out the stomach with *salt and water*.

Albumin.

Stimulants.

Acidum Nitricum. NITRIC ACID. HNO_3 .**Materia Medica.**

Dose. 1 to 5 min. (diluted).

Pharmacology.

CAUSTIC, DISINFECTANT.

CAUSTIC. **Acids** act as caustics by depriving the tissues of water, by forming acid albumins (which are soluble in strong acids, and so do not form a protective barrier), and by softening the connective tissues.

DISINFECTANT. They are thus also destructive to germ life.

Therapeutics.

CAUSTIC. The caustic action of nitric acid has been made use of to destroy the dental pulp; the drug is applied to the surface of the pulp on wood points or asbestos fibre, and as soon as a slough has formed it is gently cut away and more acid applied: it is thus possible with very little pain to destroy a pulp in about half an hour. Should any of the acid come in contact with the enamel it will, of course, damage it seriously.

DISINFECTANT. Pure nitric acid and "*fuming nitric acid*" are sometimes used as disinfectant caustics to destroy parasitic germs in cases of rapid spreading gangrenous inflammation, such as cancrum oris; the drug is applied to the bleeding surface left after scraping away the sloughs.

Toxicology.

1 fluid drachm has killed a man.

Symptoms of poisoning.

Violent burning pain in throat and stomach.

Retching and vomiting.

Excoriation of the mouth.

Dysphagia, dyspnœa, thirst.

Treatment.

Do not use a stomach-pump.

$\frac{1}{2}$ oz. of *magnesia, chalk, soda*, or whiting.

Morphine hypodermically.

Nutrient enemata for feeding afterwards.

Stimulants.

Potassii Hydras. POTASSIUM HYDRATE. KOH.**Materia Medica.**

Synonyms. Caustic potash, potassa caustica.

Dose. Not given internally.

Characters. White pencils, hard but very deliquescent, and alkaline.

Solubility. 2 in 1 of water,
1 „ $3\frac{1}{2}$ „ alcohol,
1 „ 3 „ glycerine.

Incompatibles. Alkaloids, tannin.

Preparations. *Liquor potassae.* (6·2% B.P.)

Dose. 15 to 60 min.

Potassa cum calce.

Equal parts of caustic potash and lime (CaO).

Vienna paste.

Equal parts of caustic potash and slaked lime (Ca(OH)₂) mixed with glycerine or alcohol.

Pharmacology.

CAUSTIC, CLEANSING, ANTACID.

CAUSTIC. Solid **alkalies**, or strong solutions of them, act as caustics by depriving the tissues of water, and by forming alkali-albumins: these are very soft and soluble, so that the action penetrates very deeply.

CLEANSING. See p. 94.

ANTACID. See p. 95.

Therapeutics.

CAUSTIC. *Potassa cum calce* is a useful preparation for destroying polypi of the gum or pulp, but great care must be taken when using it. It is liable to penetrate much further than is desired. When using it the gum should be cleansed and dried, and the access of saliva prevented as far as possible. A small portion should then be applied to the gum and its action watched. As soon as the apple-jelly-like slough has formed it should be cut away, and the part well syringed with warm water. A second application can be made if necessary, but the drug should never be left on the part. It is very apt to cause pain.

CLEANSING. See p. 94.

ANTACID. See p. 95.

Toxicology.*Symptoms of poisoning.*

Burning pain in throat and stomach.
Retching and vomiting of blood.
Excoriation of mouth.

Treatment.

Do not use stomach-pump.
Vinegar, lemon juice.
Morphia hypodermically.
Stimulants.

Liquor Sodii Ethylatis. SOLUTION OF ETHYLATE OF SODIUM.

Materia Medica.

Dose. Not given internally.

Characters. A colourless syrupy liquid.

Incompatible. Chloroform.

Composition. It is made by dissolving 1 part of sodium in 20 parts of ethylic alcohol. It contains 19% of the solid salt $\text{NaC}_2\text{H}_5\text{O}$.

Preparation.

Sodii Ethylas, the solid salt. **Non-official.**

Pharmacology.

CAUSTIC.

CAUSTIC. It acts by absorbing and combining with the water of the tissues. It soon becomes neutralised by saturation.

Therapeutics.

CAUSTIC. It is a mild caustic which does not penetrate very far, and may be employed to destroy polypi of the gum.

Acidum Carbolicum. See p. 84.

Pharmacology.

ANTISEPTIC, DISINFECTANT, CAUSTIC, LOCAL ANÆSTHETIC.

CAUSTIC. Pure carbolic acid acts as a caustic by producing a coagulation of the tissues, without entering into chemical combination with them; hence, not being neutralised by the tissues, and being volatile, it will penetrate deeper than the metallic salts, but the coagulum formed prevents really deep penetration.

Therapeutics.

CAUSTIC. Pure carbolic acid is useful for the destruction of the pulp in the teeth of children, when the root is incomplete, and may be left in contact with the part under a dressing. In spite of its slight penetration its anæsthetic and disinfectant properties render it very useful.

Carbolic may also be used to destroy the dentinal fibrils in a sensitive cavity, and thus act as an **obtundent**. It should be applied pure and driven off with hot air. It does not penetrate deeply.

The caustic action of carbolic acid is also to be remembered when employing the drug for other purposes in full strength, and care taken to avoid touching the lips or gums with it. In the event of such an accident the part should be at once rubbed with *glycerine* or *oil*.

COUNTER-IRRITANTS.

An irritant is called a **counter-irritant** when it is applied to the skin, or mucons membrane, with the object of altering the size of the blood-vessels of subjacent viscera.

Thermal, mechanical, or chemical stimuli may be made use of as counter-irritants.

Counter-irritants of various degrees of activity are made use of in dentistry :—

1. Hot fomentations, slices of hot boiled fig, a hot boiled raisin, or scarification.
2. Capsicum plasters, turpentine, ammonia.
3. Iodine, or mustard.
4. Iodine and scarification.
5. The actual cautery.

The last is so severe, and the wound so slow to heal, that it probably does more harm than good.

Counter-irritants are supposed to act :—

1. By dilating the cutaneous blood-vessels, and so relieving the blood pressure in the tissues immediately below.

Example.—A poultice, fomentation, or hot mouth-wash.

2. By stimulating the nerves, and so causing a reflex contraction of the vessels supplying the parts below.

Example.—Capsicum.

The application of cold over the root of a tooth suffering from periostitis will cause direct contraction

of the superficial and reflex contraction of the deep vessels, and so give temporary relief. The application of a warm poultice to the side of the face will cause dilatation of the cutaneous vessels (facial artery), and drain off some of the blood from an inflamed tooth ; or it may, if very large, cause dilatation of the external carotid artery, and thus increase the flow of blood to both superficial and deep vessels.

The application of heat as a counter-irritant within the mouth must be nicely graduated and carefully placed, or it may increase rather than relieve the subjacent congestion.

Massage to the surface will stimulate an increased blood-flow in a part and in the parts in immediate connection with it.

Scarification, lancing, and the application of leeches will deprive the parts of blood, and relieve congestion in their immediate neighbourhood, but are liable to introduce infective complications.

Capsicum. CAYENNE PEPPER.

Materia Medica.

Source. The dried fruit of *Capsicum minimum*.

Preparations. *Tinctura Capsici* (5%).

Dose. 5 to 60 mins.

Oleo resina Capsici. (Non-official B.P.)

Pharmacology.

Has a powerful stimulant action similar to that of the volatile oils, but more superficial and prolonged.

Therapeutics.

Capsicum in the form of a plaster is often used for its counter-irritant effect as an application over

inflamed roots. It is milder but less efficacious than iodine, and the plasters may be entrusted to the patient for use when required. The gum must be dried before applying the plaster.

A mild plaster may be prepared thus :—

Take of

Rubber 10 parts, melt and add
Yellow Paraffin 1 part.

Heat at not exceeding 150° C. to liquefy.
 Then warm and add melted

Yellow Resin 10 parts.
Orris Root 4 parts, and work in
Capsicum 4 parts, powdered very fine.

Spread on linen and cut into small pieces.

A stronger plaster may be prepared by proceeding as above, but leaving out the powdered capsicum, and then painting the finished plaster over with *Capsicum oleo resin*.

Iodum. IODINE. I. See p. 77.

Pharmacology.

IRRITANT, ANTISEPTIC, DISINFECTANT, ACCELERATOR OF TISSUE CHANGES.

IRRITANT. Iodine is volatile and therefore penetrates well. It precipitates proteids, and enters into loose chemical combination with them. Its action is both deep and lasting, but is comparatively mild in quality.

ANTISEPTIC AND DISINFECTANT. See p. 77.

ACCELERATOR OF TISSUE CHANGES. See p. 170.

Therapeutics.

IRRITANT. As a counter-irritant a mixture of equal parts of the *Liquor Iodi Fortis* and *Fleming's Tincture of Aconite* is used.

Fleming's Tincture of Aconite (non-official), being a powerful preparation (dose, $\frac{1}{8}$ -1 m.), should be used with great care. See p. 108.

As an application in cases of periostitis it frequently has a good effect, which may be attributed to :—

1. Its causing a superficial inflammation.
2. Some of the iodine penetrating deeper and causing absorption of inflammatory products.
3. The disinfectant action of the drug around the neck of the tooth.

When applying the drug, the gum should be first dried. Then, with a piece of cotton-wool wrapped round a wooden match, the gum over all the root should be painted with the mixture till stained brown; then let the patient rinse his mouth before swallowing. If used undiluted and too often, vesication will take place, and the inflammation may penetrate too deeply and increase the trouble.

Iodine stains the skin and linen, and it or its vapour will destroy steel instruments.

Liquor Iodi Fortis, when painted over the teeth and allowed to dry on, will deeply stain any film or "plaque" and render it very easy to be seen. It is thus a great aid to thorough cleansing. The stain only endures for about ten minutes.

Iodine stains may be removed from the fingers by ammonia solutions.

Sinapis. MUSTARD.**Materia Medica.**

Source. The dried ripe seeds of *Brassica alba* and *nigra*.

Pharmacology.**COUNTER-IRRITANT AND EMETIC.**

COUNTER-IRRITANT. When applied to the mucous membrane mustard quickly causes dilatation of the superficial vessels and stimulation of the nerves, producing redness and burning pain, followed by a loss of sensibility to other pain. If left on too long vesication will follow.

Therapeutics.

COUNTER-IRRITANT. Mustard plasters may be applied over the root of a tooth to relieve the pain of periodontitis until more efficient treatment can be given.

EMETIC. From one to four teaspoonfuls stirred up with a tumblerful of warm water is a readily obtainable quick emetic.

ASTRINGENTS AND LOCAL STIMULANTS.

Astringents (*astringo*, I draw together) are substances which contract tissues and limit exudation and secretion.

From a therapeutic standpoint astringents may be divided into those used internally and those used externally. The former include means which check secretion in the alimentary canal (gastric and intestinal astringents) by their direct action on the mucous membrane and blood - vessels. Those employed externally and in the mouth are alone dealt with here, and only in connection with their local action.

Local stimulants are substances, or means, which, applied locally, increase the activity of the cells.

ASTRINGENTS act by precipitating and coagulating proteids quickly, and in such a form that the coagulum is practically impermeable to the precipitant. They lessen the typical process of inflammation (congestion and increased permeability of the capillary walls) and hasten the absorption of effusions. This is done by coagulating the proteids and thus, by either forming an extra coat to the capillaries or, more probably, hardening the cement substance between the endothelial cells, preventing exudation. The absorption of effusions is probably caused by precipitating their proteid elements and thus increasing their fluidity and rate of osmosis. A contraction accompanies the coagulation of tissues, and some astringents also stimulate the muscular tissue in the vessel walls, both actions tending to reduce the size of the blood-vessels.

From their coagulating action it follows that astringents are only modified caustics, and this fact

makes them of little use in acute inflammation, when they may lead to necrosis rather than to healing.

Applied to mucous membranes astringents limit secretion as well as exudation.

LOCAL STIMULANTS are again modified caustics; the irritation of the cells being kept within physiological limits results in an increased activity of the cells, and not their destruction. Both astringents and caustics in appropriate solutions and concentration may act as stimulants.

Massage, by pressing out the stagnant fluids and semi-fluids of a part, by aiding the circulation of blood and lymph, and by gentle mechanical irritation, increases the nutrition and activity of the cells, and so is a local stimulant.

Local stimulants are of use to hasten the process of absorption after the extraction of teeth, in which case massage appears to be the most potent. For hastening the growth of granulations and the exfoliation of dead tissues in cases of pyorrhœa alveolaris and empyema antri, a change of drug occasionally seems to be more beneficial than always using the same.

Cupri Sulphas. COPPER SULPHATE. $\text{CuSO}_4, 5 \text{H}_2\text{O}$.

Materia Medica.

Synonyms. Blue-stone, blue vitriol.

Dose.

$\frac{1}{4}$ to 2 grs. as a tonic.

5 to 10 grs. as an emetic.

Characters. Deep blue crystals, with a strong styptic, metallic taste.

Solubility.

1 in $3\frac{1}{2}$ of water.

Almost insoluble in alcohol.

1 in $2\frac{1}{2}$ of glycerine.

Incompatibles. Alkalies and their carbonates, iodides, most vegetable astringents, steel instruments.

Pharmacology.

ASTRINGENT, STIMULANT, ANTISEPTIC, DISINFECTANT, CAUSTIC, EMETIC, TONIC, MUMMIFYING AGENT.

ANTIPHLOGISTIC. (*ἄντι, φλογίζω*, I burn.) Drugs or means which allay inflammation.

The ASTRINGENT, STIMULANT, and ANTISEPTIC properties of the metallic salts are all due to the same action, and when not too violent they tend to reduce inflammation.

It is here proposed to treat of them all together under the heading of antiphlogistic, taking copper sulphate as a type.

Copper sulphate in solutions of 2 to 5 grs. to the ounce, applied to a mucous membrane or ulcer, precipitates the proteids of the exudation, and some of the copper unites with them to form albuminates. This produces a protective film of material unfavourable to the growth of germs. The blood-vessels are acted upon in the same way, which renders them less permeable, and so limits exudation. The superficial cells are coagulated and contracted, whilst the deeper cells, being reached only by a more dilute portion of the solution, are irritated and stimulated to greater activity. The germs are acted upon, as are the superficial cells, and coagulated, whilst the medium in which they live is at the same time rendered very unfavourable for their growth. The fluid portion of the exudate, being freed from its proteids, becomes more diffusible and is quickly absorbed. The coagulum, being insoluble, prevents deep penetration of the copper sulphate.

DISINFECTANT. In 5% solutions copper sulphate destroys germs.

CAUSTIC. In the solid form copper sulphate is a caustic, similar in action to the other metallic salts (see p. 19), but is milder than either zinc chloride or silver nitrate.

EMETIC. Copper sulphate in large doses (5 to 10 grs.) is an irritant to the mucous membrane of the stomach, and thus acts as a direct emetic.

TONIC. No use is made of this action by the dentist.

Therapeutics.

ANTIPHLOGISTIC. (*Astringent, stimulant, anti-septic.*) Solutions of copper sulphate, 2 to 5 grs. to the ounce, are employed as mouth-washes and lotions for washing out the antrum in cases of chronic inflammation, and but for their unpleasant taste would be very useful.

R.

<i>Cupri Sulphatis</i>	gr. xxx.
<i>Glycerini</i>	3 j.
<i>Aquam Rosae</i>	ad 3 ij.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be mixed with an equal quantity of water, and held in the mouth as long as possible.

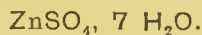
DISINFECTANT, STIMULANT, ANTISEPTIC. The most common use for copper sulphate is in the treatment of *pyorrhœa alveolaris*. The powdered crystals are packed into the sockets with thin splinters of wood, after the removal of all tartar. Being but slightly soluble it will remain in place for some time, and after its initial caustic and disinfectant action will continue to exert a beneficial astringent, stimulant, and antiseptic influence. If the teeth have been properly cleansed the staining is very slight. For ionic medication use a 2% or 3% solution. Copper is cationic (see p. 101).

CUPROL, a chemical combination of copper with nucleinic acid, containing 6% of copper, is said to be less irritating and to possess greater penetrating power than copper sulphate. It has been used for ionization in 2% solution in the treatment of pyorrhœa alveolaris.

The pain occasionally caused by powdered copper sulphate may be prevented by mixing the drug with a small quantity of cocaine hydrochloride.

MUMMIFYING AGENT. See p. 47.

Zinci Sulphas. SULPHATE OF ZINC.



Materia Medica.

Synonym. White vitriol.

Dose.

1 to 3 grs. as a tonic.

10 to 30 grs. as an emetic.

Solubility.

10 in 7 of water.

Insoluble in alcohol.

Incompatibles. Alkalies and their carbonates, lime water, tannin.

Pharmacology.

ASTRINGENT, STIMULANT, ANTISEPTIC, EMETIC.

ASTRINGENT, STIMULANT, ANTISEPTIC. Zinc sulphate is similar to, but milder in its action than, copper sulphate. It does not stain, and has a less unpleasant taste.

EMETIC. Being an irritant to the mucous membrane of the stomach, in large doses (10 to 30 grs.) it acts as a direct emetic.

Therapeutics.

ANTIPHLOGISTIC. (*Astringent, stimulant, anti-septic.*) A solution of 8 grs. to the ounce forms a useful lotion for chronically inflamed antra or as a mouth-wash. For ionic medication use a 2% or 3% solution. Zinc is cationic (see p. 101).

R.

Zinci Sulphatis 3 j.
Aquae Cinnamomi 3 iv.

Misc. Fiat lotio.

Signa. The concentrated lotion.

To be diluted with an equal quantity of water.

R.

Zinci Sulphatis 3 j.
Glycerini 3 ij
Aquam Rosae ad 3 ij.

Misc. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be diluted with an equal quantity of water.

Alumen.

POTASH ALUM. $\text{Al}_2 (\text{SO}_4)_3 \text{K}_2 \text{SO}_4, 24 \text{H}_2\text{O}$;AMMONIA ALUM. $\text{Al}_2 (\text{SO}_4)_3, (\text{NH}_4)_3 \text{SO}_4, 24 \text{H}_2\text{O}$.

Materia Medica.

Dose. 10 to 20 grs.

Characters. Colourless crystals, with an acid, sweetish, astringent taste. Solutions are acid in reaction from impurities.

Solubility. 1 in 11 of cold water. (3 in 1 of hot.)
 Insoluble in alcohol.
 1 in 3 of glycerine.

Incompatibles. Alkalies, lime, lead, tannic acid, mercury, salt.

*Preparations.**Alumen Exsiccatum*, dehydrated potash alum.*Glycerinum Aluminis* (1 in 7).

Pharmacology.

ASTRINGENT, CAUSTIC, STYPTIC, EMETIC,
ANTISEPTIC, HASTENS THE SETTING OF PLASTER.

ASTRINGENT. Alum has a similar action to the other metallic salts, but the precipitate formed is slowly soluble in excess of proteid.

CAUSTIC. *Alumen Exsiccatum* rapidly absorbs water from the tissues as well as precipitating the proteids. It is a mild caustic.

STYPTIC. See p. 55.

EMETIC. Alum in large doses (60 grs. mixed with syrup) irritates the stomach and is a direct emetic.

ANTISEPTIC. Alum is an antiseptic 1 in 200.

EFFECT ON PLASTER. Alum hastens the setting, reduces the expansion, and permanently hardens plaster casts; by what means is unknown.

Therapeutics.

ASTRINGENT. Solutions of alum 10 grs. to the ounce, or the *Glycerinum Aluminis*, are effective astringent applications for chronic inflammatory conditions of the throat and mouth. The acid reaction of alum solutions prohibits its frequent use as a mouth-wash when there are teeth standing.

Rx.

<i>Aluminis</i>	℥ j.
<i>Zinci Sulphatis</i>	℥ ss.
<i>Sodii Biboratis</i>	gr. iv.
<i>Aquae Rosae</i>	℥ viij.

Misce. Fiat collutorium.

Signa. The mouth-wash.

Only to be prescribed for edentulous patients.

CAUSTIC. Not used in dentistry.

STYPTIC. See p. 55.

Argenti Nitras. See p. 20.

Pharmacology and Therapeutics.

CAUSTIC, ASTRINGENT, STIMULANT, ANTISEPTIC,
DISINFECTANT, STYPTIC.

ASTRINGENT, STIMULANT, AND ANTISEPTIC.
Weak solutions, **1 to 5 grs. to the ounce**, of nitrate of silver have their caustic action so reduced as to become astringent and stimulant, but their taste and staining effect prohibit their use in the mouth.

Should it be desired to employ a silver preparation for its astringent and stimulant effect in the mouth, *Argyrol*, a silver salt containing 30% metallic silver combined with a proteid (vitellin) obtained from wheat, and which is soluble in water and non-irritating to mucous membranes, would seem preferable to solutions of silver nitrate. Argyrol solutions stain very much less than other silver salts, and may be used in the strength of 8 to 20 grains to the ounce.

Protargol is a similar preparation containing 8 % silver combined with a proteid.

For ionic medication use a 1 % solution. Silver is cationic (see p. 101).

Zinci Chloridum. See p. 18.

Pharmacology and Therapeutics.

CAUSTIC, ASTRINGENT, STIMULANT, ANTISEPTIC,
DISINFECTANT.

ASTRINGENT, STIMULANT, AND ANTISEPTIC.
Weak solutions, **6 grs. to the ounce**, are astringent and stimulant. Their action is more vigorous than the sulphate, in part due to their greater solubility. For ionic medication see zinc sulphate, p. 36.

R.

Zinci Chloridi gr. vj.*Zinci Sulphatis* gr. viij.*Aquae* ʒ viij.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be diluted with an equal quantity of water.

Potassii Permanganas. See p. 73.**Pharmacology.**

CAUSTIC, ASTRINGENT, ANTISEPTIC, DISINFECTANT,
DEODORANT.

ASTRINGENT. Weak solutions, 8 grs. to the pint (circ. 1-1000), are astringent and deodorant.

Therapeutics.

ASTRINGENT. Permanganate of potash is a useful astringent mouth-wash, though its staining action and taste are objectionable.

Acidum Sulphuricum Aromaticum.

AROMATIC SULPHURIC ACID.

Materia Medica.

Composition. Sulphuric acid, spirit, spirit of cinnamon and strong tincture of ginger, and contains :—

(13·8% of sulphuric acid B.P.).

(20% ,, ,, U.S.P.).

Dose. 5 to 20 mins.

Pharmacology.

ASTRINGENT, STIMULANT, ANTISEPTIC, DECALCIFYING AGENT.

ASTRINGENT, STIMULANT, ANTISEPTIC. Weak solutions of acids act very similarly to the metallic salts, producing a coagulum which they are unable to penetrate; also they set up diffusion currents which alter the molecular structure of the cells. The alcohol and aromatic bodies in this particular preparation will add to its general effect.

DECALCIFYING AGENT. The aromatic acid soon dissolves tartar and fragments of dead bone; it also quickly damages enamel.

Therapeutics.

On account of all these actions, *Aromatic Sulphuric Acid* is used in the treatment of *pyorrhœa alveolaris* to help cleanse the pockets and stimulate the tissues. Great care is, however, necessary to protect the enamel, and it can only be advisedly used when the gum has much receded.

Myrrha. MYRRH.**Materia Medica.**

Dose. 10 to 30 grs.

Source. A gum resin obtained from the stem of *Balsamodendron Myrrha*.

Composition. It contains a gum (60%), a volatile oil, and a resin.

Preparations.

Tinctura Myrrhæ (20%). *Dose.* $\frac{1}{2}$ to 1 dr.

Pharmacology.

STIMULANT, ANTISEPTIC, SIALAGOGUE.

STIMULANT. Myrrh owes its stimulant action to the volatile oils and resins which it contains, and which act principally by their volatility and irritant action on the nerves. The gum tends to modify the action.

ANTISEPTIC. Also due to the volatile oil.

SIALAGOGUE. Myrrh is sialagogue from its aromatic taste.

Therapeutics.

Tincture of Myrrh, diluted about eight times with water, is a useful, pleasant, and astringent STIMULANT to the gums, with an aromatic taste and slight antiseptic action; applied on pledgets of wool between and around the teeth after scaling, or

removing soft masses of tartar, it produces a beneficial effect upon the inflamed gums.

As a mouth-wash.

R.

<i>Tincturae Myrrhae</i>	5 j.
<i>Thymol</i>	gr. j.
<i>Aquam Chloroformi</i>	ad 5 iv.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be diluted with an equal quantity of water, and applied to the gums with a brush or pledget of wool.

Pyrethri Radix. See p. 120.

Pharmacology.

STIMULANT, SIALAGOGUE, LOCAL ANÆSTHETIC.

STIMULANT AND LOCAL ANÆSTHETIC. Pellitory root derives its stimulant action from the volatile oils and resins it contains, and from the presence of a body allied to piperine, all of which are volatile stimulants which penetrate well. They eventually depress sensation by over-stimulation of the nerves.

Therapeutics.

Tincture of Pyrethrum, diluted about eight times with water, forms a pleasant STIMULANT application to inflamed gums, similar to but more powerful in its action than myrrh.

R.

<i>Acidi Tannici</i>	gr. xx.
<i>Tincturae Pyrethri</i>	5 iij.
<i>Aquam Rosae</i>	ad 5 ij.

Misce. Fiat collutorium.

Signa. The astringent mouth-wash.

To be applied to the gums with a tooth-brush or pledget of wool.

Alcohol. See p. 160.

Pharmacology.

STIMULANT, ASTRINGENT, LOCAL STIMULANT,
ANTISEPTIC, SOLVENT.

LOCAL STIMULANT. Alcohol, by its affinity for water and solvent action on certain constituents of the cells, causes a stimulation, and later on a depression of activity.

Therapeutics.

Alcohol is used as a solvent for other stimulants, as in the tincture of Pyrethrum, in order to increase their action, and itself acts as a STIMULANT.

Chlorum. CHLORINE, Cl.

Materia Medica.

Dose. Not given pure.

Preparations.

Calx Chlorinata (B.P. & U.S.P.). 35% Cl.

(Chlorinated Lime).

Dose. 3 to 6 grs.

Liquor Sodæ Chlorinatae (B.P. & U.S.P.). 2½% Cl.

(Labarraque's Solution.)

Dose. 10 to 20 mins.

Liquor Calcis Chlorinatae (B.P. 1 in 10.). 2% Cl.

Pharmacology.

CAUSTIC, STIMULANT, DISINFECTANT, ANTI-
SEPTIC, BLEACHING AGENT.

CAUSTIC. Not used.

STIMULANT. Chlorine penetrates rapidly, and enters into loose combination with the cells, precipitates proteids, and stimulates tissues.

DISINFECTANT AND ANTISEPTIC. See p. 81.

BLEACHING AGENT. See p. 139.

Therapeutics.

STIMULANT, ANTISEPTIC. Weak solutions of chlorine are employed as stimulating disinfectant lotions in sloughing conditions and membranous inflammation of the mouth, on account of their penetrating power.

Rx.

<i>Liquor Calcis Chlorinatae</i>	3 ij.
<i>Aquam</i>	ad O. j.

Misce. Fiat collutorium.

Signa. The stimulant disinfectant lotion.

Acidum Tannicum. TANNIC ACID. $C_{14}H_{10}O_9$.

Materia Medica.

Synonyms. Digallic anhydride, tannin.

Dose. 2 to 10 grs. or more.

Solubility.

10 in 8 of water or alcohol.

1 in 3 of glycerine.

Incompatibles. Gelatine, mineral acids, alkalies, salts of lead, salts of silver, per-salts of iron, most alkaloids, vegetable emulsions.

Preparations. *Glycerinum Acidi Tannici.* 1 in 5.

Pharmacology.

ASTRINGENT, STYPTIC, ANTISEPTIC, MUMMIFYING AGENT.

·ASTRINGENT. Tannin acts by precipitating proteids, connective tissues, and gelatine ; thus limiting exudation and passively constricting the blood-vessels. Its direct action on the blood-vessels is to dilate them, but the indirect action is far the stronger.

MUMMIFYING AGENT. See p. 48.

Therapeutics.

ASTRINGENT. Solutions of tannin, 5 to 8 grs. to the ounce, are often used as astringents to allay chronic inflammation of the mucous membrane of the mouth or throat. To hasten the resolution of the swelling caused by a regulation plate (after easing the plate) paint the dried gum with the *Glycerinum Acidi Tannici*.

As a lotion :—

Rx.

<i>Acidi Tannici</i>	$\bar{\zeta}$ ss.
<i>Eau de Cologne</i>	$\bar{\zeta}$ iv.

Misce.

Signa. The concentrated mouth-wash.

Add 10 to 12 drops to a teaspoonful of warm water and use as a mouth-wash three or four times a day.

Hamamelis. See. p. 55.

Pharmacology.

ASTRINGENT, STYPTIC.

ASTRINGENT. Hamamelis owes its astringent properties to the tannin it contains. Different plants contain different forms of tannin, which often differ in activity.

Therapeutics.

ASTRINGENT. *Liquor Hamamelidis* and "*Hazeline*," diluted with two or three volumes of water, are favourite preparations as astringent lotions for use in the mouth after extraction of several teeth, on account of their pleasant taste and sedative effect; the drug seems to act more powerfully than the quantity of tannin in it would warrant.

Krameria Radix. RHATANY ROOT.

Materia Medica.

Source. The dried root of Para or Peruvian rhatany.

Incompatibles. Same as for tannin.

Preparations.

Tinctura Krameria (20%). Dose. $\frac{1}{2}$ to 1 drm.

Pharmacology.

ASTRINGENT, COLOURING AGENT.

ASTRINGENT. *Krameria* contains from 20 to 45% of tannin, to which its actions are due.

COLOURING AGENT. See p. 124.

Therapeutics.

Tincture of Krameria is used as much for its fine red colour and pleasant odour as for its astringent properties in mouth-washes.

Take of

Tincture of Krameria

Boroglyceride

Eau de Cologne

Spirit of Chloroform of each 4 drms.

Rectified Spirit up to 4 ounces.

Mix. Let a mouth-wash be made.

Label. The concentrated mouth-wash.

One teaspoonful to be mixed with a wineglassful of water, and held in the mouth as long as possible.

MUMMIFYING AGENTS.

Mummifying agents are substances which tend to dry, harden, and render tissues less liable to putrefaction.

MUMMIFYING AGENTS are a mixed group, and act in various ways, as by drying the part, coagulating and hardening the tissues, or permeating it with an antiseptic. The object is to so alter the tissue as to render it unfavourable to the growth of germs, and less likely to undergo putrefaction. Cataphoresis, or ionic medication, is an efficient means of securing adequate penetration.

The total removal of the tooth pulp, and its replacement with an aseptic non-absorbent root filling, is the best form of treatment for dead teeth; but where this is impossible mummifying agents offer the greatest probability of permanent success.

Iodoformum. See p. 78.

Therapeutics.

MUMMIFYING AGENT. By forming an antiseptic scab and permeating the pulp with iodine.

For formula see p. 79.

Cupri Sulphas. See p. 33.

Therapeutics.

MUMMIFYING AGENT. On account of its coagulating and disinfectant action, copper sulphate has been recommended as an application to dead, or partially dead, tooth pulps, as a preservative; but, thus shut in under a filling, copper sulphate in time permeates the dentine and produces very bad staining of the tooth. Its action is slow but effectual.

Acidum Tannicum. See p. 44.**Therapeutics.**

MUMMIFYING AGENT. Tannin is used as a mummifying agent because it combines with the tissues to form an insoluble tannate, causing them to shrink and become harder and less fermentable, and in time considerably alters them.

Leather is tanned skin and very little liable to fermentation, but it is not possible to so thoroughly incorporate the tannin with the tooth pulp as it is in the skin, nor is pulp as firm and unfermentable as skin.

Formic Aldehyde. See p. 81. Non-official.**Pharmacology.**

ANTISEPTIC, DISINFECTANT, DEODORANT,
CAUSTIC.

Therapeutics.

MUMMIFYING AGENT. *Formaline* is a 40% solution of *Formic Aldehyde*, and has the power of very rapidly and deeply penetrating animal tissues, and of coagulating and hardening the cells and matrix without causing shrinking. It is also a powerful disinfectant. A 15% solution of *Formic Aldehyde* has therefore been used for hardening and preserving the pulp *in situ*. Its disadvantage is that it has a powerful and lasting irritant action. The vapour from the solution is very irritating to the conjunctiva and nasal mucous membrane.

Recent experiments have shown that formic aldehyde placed in the pulp cavity will penetrate a considerable distance through dentine, and also through the apical foramen of roots, and will inhibit the growth of bacteria; no other drug has been shown to do this. As the formic aldehyde soon volatilises it is well to mix it with a more permanent antiseptic, such as thymol or tricresol, for use as a mummifying agent.

Formic aldehyde (or paraform) is the active ingredient of most so-called "abscess cures."

A paraform mummifying paste may be prepared thus :—

<i>Take of</i>	
<i>Thymol</i>	1 drachm.

Triturate thoroughly and add

<i>Paraform</i>	20 grains.
<i>Zinc Oxide</i>	2 drachms.
<i>Glycerine</i>	q.s.

Mix to form a stiff paste.

This preparation rapidly loses strength.

Betanaphthol. See p. 89. Non-official.

Pharmacology.

ANTISEPTIC, DISINFECTANT.

Therapeutics.

MUMMIFYING AGENT. After a tooth has been thoroughly dehydrated, an alcoholic solution of betanaphthol may be made to penetrate very deeply and to disinfect as it goes. It is not so irritant as formaline, but moisture prevents its penetration.

Cresol. See p. 86. Non-official.

Therapeutics.

Cresol and tricresol are used as disinfectant mummifying agents, on account of their depth of penetration and permanence of action. *Guaiacol* (see page 88) is employed for similar purposes and for cataphoric application.

Arsenic and Carbolic Acid should not be used as mummifying agents; the first because it will probably penetrate beyond the dentine and destroy the periodontal membrane, and so loosen the tooth; and carbolic acid because it is volatile and will soon evaporate and leave the pulp unprotected.

STYPTICS, HÆMOSTATICS.

Styptics (στυφω, I contract, draw together) and

Hæmostatics (αἷμα, blood, ἵστημι, I stop, check) are agents which control or avert hæmorrhage.

They all act by imitating or assisting natural processes, and may stop bleeding :—

1. By acting on the **blood**, favouring coagulation, or solidifying the albuminous constituents, and thus plugging the bleeding points.
2. By promoting contraction of the wall of the ruptured **vessels**. Active astringents.
3. By acting on the **perivascular tissues**, and coagulating and constricting their protoplasm, so that the torn vessels are compressed or closed. Passive astringents.

The means used in dentistry comprise :—

1. Direct Pressure.
2. Heat and Cold.

These act by causing contraction of involuntary muscular fibre in the vessel walls, and their consequent closure allowing the formation of a clot. Heat is the more efficacious as acting more rapidly, and successive applications do not exhaust the muscular fibre, as is the case with cold.

Hot or cold water is of great use in checking hæmorrhage due to operations in the month, particularly that arising from tooth extraction.

Hot water must be used quite hot, *i.e.*, at a temperature at which it is only just possible to bear the finger in it. Cold water as cold as possible. "Luke-warm" temperatures and those about blood-heat are likely to keep up the bleeding.

In the case of hæmorrhage from tissues previously acutely inflamed cold is best avoided as likely to depress an already lowered vitality.

Heat applied in the form of the actual cautery is a powerful hæmostatic. The bleeding point or surface is blocked by the formation of a thick slough or eschar ; on the separation of which, however, secondary hæmorrhage is not unlikely to occur. A dull red or black heat is the best to employ.

The actual cautery is of service to the surgeon in major operations about the mouth (such as removal of the jaw), but has only a theoretical interest for the dentist.

3. Drugs.

These may act in any of the ways described above, and are employed :—

1. As local applications to the seat of hæmorrhage.
2. As medicines administered internally, or by hypodermic injection, which favour coagulation of the blood, or constrict the vessels generally.

The use of heat, cold, or surgical measures is *always to be preferred* to that of styptic drugs where the seat of hæmorrhage is accessible ; and when employed the latter are to be regarded as auxiliaries only, and not made use of exclusively.

Except that local styptic applications may be used, and are frequently of service to the dentist, in quite trivial bleeding.

Example.—Oozing from a gum accidentally lacerated by an instrument into a cavity it is desired to excavate or fill ; though even here other means (such as application of the rubber dam) are to be preferred, if available.

The great objection to the use of powerfully astringent drugs (such as iron salts and silver nitrate) as local hæmostatics is that they frequently cause inflammation and sloughing of the tissues. Secondary hæmorrhage sometimes occurs on the separation of the slough, though this is less likely to occur if the part be kept clean. Hence the use of such agents, except as a last resort, is to be avoided.

In applying a styptic drug for the arrest of persistent hæmorrhage after tooth extraction, it is necessary first of all to remove clot and *débris* from the socket, which can be effected by syringing or mopping. (When once the bleeding has ceased the clot must, of course, not be interfered with.) Then wipe the socket as dry as possible, so as to ascertain from which part the bleeding proceeds, and, in the case of multiple-rooted teeth, from the alveolus of which root; then quickly, before the blood collects again, apply the drug on a pledget of cotton-wool or lint, taking care that it comes in contact with the bleeding point. Leave the wool in place, and over this place pieces of rolled lint, so as, if possible, to obtain pressure from opposing teeth when the jaws are closed, or secure by ligature to neighbouring teeth. Bandaging the jaws together may be necessary in the case of young patients. Instruct the patient to avoid lying down, or taking stimulants or warm food or drink. Remove the plug within twenty-four hours, or decomposition and consequent septic infection may result.

Internal hæmostatic medicines may be administered, though not much to be relied upon.

Ferri Perchloridum. PERCHLORIDE OF IRON. $\text{Fe}_2 \text{Cl}_6$.

Materia Medica.

Incompatibles.

All preparations containing tannic or gallic acids, alkalies and their carbonates, magnesia, chalk.

Preparations.

Liquor Ferri Perchloridi Fortis.

Not given internally.

Liquor Ferri Perchloridi.

Strong solution 1. Water 3. Dose. 5 to 15 mins.

Tinctura Ferri Perchloridi.

Strong solution 1. Alcohol 1. Water 2.

Dose. 5 to 15 mins.

Pharmacology.

STYPTIC, ASTRINGENT, CAUSTIC, HÆMATINIC,
AND TONIC.

The styptic action of perchloride of iron may be taken as typical of that of all the **Ferric Salts** (per-salts).

STYPTIC. Applied to a bleeding surface, this drug quickly causes coagulation of the blood and consequent plugging of the bleeding vessels. The albuminous fluids in the tissues are also coagulated, and the contraction set up around the vessels compresses them and diminishes their calibre. There is probably no direct effect on the muscular fibre of the vessel walls.

TONIC. See page 152.

CAUSTIC. Not used for this purpose.

ASTRINGENT. Not used in dentistry for this purpose.

Therapeutics.

STYPTIC. *Per-salts of Iron* are the most powerful local hæmostatics that we possess, but it is better

never to employ them in any strength except as a last resort, on account of their tendency to cause sloughing and secondary hæmorrhage.

Styptic wool, or cotton-wool saturated with a weak ***solution of Perchloride of Iron***, is sometimes usefully employed to check quite trivial hæmorrhage from the gums when this is interfering with an operation on a tooth.

Take of

<i>Alum</i>	2 drachms.
<i>Solution of Perchloride of Iron</i>	2 „
<i>Water</i>	1½ ounces.
<i>Absorbent cotton</i>	1 ounce.

Dissolve the alum in the water and add the perchloride of iron solution. Pour over the cotton in such a way that all is absorbed. Afterwards, by means of a press, squeeze the damp cotton until the solution is evenly distributed. **Dry.**

Sulphate of Iron (a ferrous salt) is a useful STYPTIC, and one having less escharotic action than the iron per-salts. It may be applied to the spot in the form of the dried powder (***Ferri Sulphas Exsiccata***).

Argenti Nitras. See p. 20.

Pharmacology and Therapeutics.

HÆMOSTATIC. Has a styptic action similar to that of perchloride of iron, save that in addition it causes active contraction of the blood-vessels. May be employed in a 10% solution to check bleeding, but owing to its powerfully caustic action should be used with caution. See p. 21.

Alumen. See p. 37.

Pharmacology and Therapeutics.

ASTRINGENT, STYPTIC, ANTISEPTIC, EMETIC.

STYPTIC. Coagulates blood and albumen in the tissues (see Perchloride of Iron), thus acting as a local hæmostatic. Is less objectionable for this purpose than per-salts of iron and nitrate of silver, as it is not nearly so caustic. Its action is, however, not so powerful in checking hæmorrhage. For alveolar bleeding it is best used as a powder applied to the socket on wool or lint.

Acidum Tannicum. See p. 44.

Pharmacology.

STYPTIC, ASTRINGENT, ANTISEPTIC, SLIGHTLY DISINFECTANT.

STYPTIC. Tannic acid dilates the blood-vessels, but used as a local hæmostatic this property is more than counterbalanced by its power of condensing or "tanning" the tissues by precipitating their albuminous constituents (thus acting as a constringent), and of coagulating the blood.

Therapeutics.

STYPTIC. Tannic acid has some disinfectant action, and is less likely to cause sloughing than per-salts of iron, and on this account is to be preferred to these for the arrest of hæmorrhage. It is used in the form of the powder applied by insufflation or on wool.

Hamamelis.

Materia Medica.

Synonym. Witch hazel.

Source. The dried bark and leaves of *Hamamelis virginica*.

Incompatibles. As for tannic acid. See p. 44.

Preparations.

Extractum Hamamelidis Liquidum.

Dose. 5 to 15 mins.

Hazeline (a speciality ; not official).

Dose. $\frac{1}{2}$ to 3 drs.

Pharmacology and Therapeutics.

HÆMOSTATIC, ASTRINGENT.

HÆMOSTATIC. *Hamamelis* contains 8% of tannic acid, also a volatile principle not yet isolated. Its local hæmostatic action is doubtless due, in part at all events, to the presence of the former constituent. It is also reputed to have a remote hæmostatic action when given by the mouth, and may thus be employed for the hæmorrhagic diathesis.

The unofficial preparation "***Hazeline***" is considered by some to be more efficacious.

ASTRINGENT. See p. 45.

Oleum Terebinthinae. OIL OF TURPENTINE.

Materia Medica.

Source. The oil distilled from the oleo-resin (turpentine) obtained from various species of *Pinus*.

Dose. 2 to 10 mins.

Solubility. Does not mix with water unless previously emulsified, hence must be prescribed with some form of mucilage.

Pharmacology.**HÆMOSTATIC, COUNTER-IRRITANT.**

HÆMOSTATIC. Administered internally turpentine contracts the vessels, and thus acts as a hæmostatic, but is not often used, as even in moderate doses turpentine may produce symptoms of irritation and congestion of the urinary organs, lumbar pain, difficulty of micturition, and even hæmaturia. Large doses may so affect the kidneys that suppression of urine results.

Therapeutics.

Styptic.
In general medicine it is used for hæmorrhage from the lungs and intestines. It has been recommended as a HÆMOSTATIC for operations about the mouth, applied on sponges locally.

Hydrogenii Peroxidum. See p. 74.**Pharmacology and Therapeutics.**

HÆMOSTATIC. In addition to other actions, it has that of a marked local hæmostatic. How it acts is not quite clear, but probably the effect is largely due to the mechanical action of the frothing caused by the liberation of the oxygen; agitation favouring coagulation. Is useful to the dentist in checking hæmorrhage from the gums during a dental operation, and used for this purpose is free from the objections which render astringent styptics undesirable.

Calcii Chloridum. CHLORIDE OF CALCIUM. CaCl_2 .**Materia Medica.**

Solubility. 1 in 1 of water.

Characters. Very deliquescent, white masses or crystals.

Dose. 5 to 15 grs.

Pharmacology and Therapeutics.

HÆMOSTATIC. Lime salts increase the rate of coagulation of the blood, and calcium ehloride has consequently been administered internally in the treatment of hæmophilia and various forms of hæmorrhage.

It is doubtful how far calcium salts administered by the mouth increase the calcium contents of the blood, though injection *sub cute* undoubtedly has this effect.

Applied locally on pledgets of cotton-wool in the strength of 30 gr. to the ounce, calcium chloride has been successful in treatment of hæmorrhage from the gums. *Calcium lactate* has been used for the same purpose. Dose (internally), 3–10 grs.

It is to be noted that, at all events out of the body, an *excess* of calcium salts will actually *retard* the coagulation of blood, saccharate of calcium having been formerly employed for this purpose in the laboratory. It is uncertain how far calcium salts administered by the mouth or rectum could act in this direction, but the fact suggests caution in the administration of large doses.

Calcium Sulphate (plaster of Paris), a material always available to the dentist, has been known to check alveolar hæmorrhage on being applied to the bleeding socket, when all other means had failed.

Ergota. ERGOT.

Materia Medica.

Synonym. Ergot of rye.

Source. The sclerotium of a fungus (*Claviceps purpurea*) which grows on *Secale cereale*, or common rye.

Dose. 20 to 60 grs.

Preparations.

Extractum Ergotae Liquidum. 1 in 1.

Dose. 10 to 30 mins.

Injectio Ergotae Hypodermica.

Contains 33% of the extract. *Dose.* 3 to 10 mins.

Pharmacology.

Ergot has no external action. Administered by the mouth or by hypodermic injection, it causes contraction of unstriated muscular tissue in all parts of the body, and consequently has a powerful effect in arresting hæmorrhage from the intestines or uterus. From its action on the muscular coat of the vessel walls it is to a certain extent a GENERAL HÆMOSTATIC, and this effect is aided by a reduction in the frequency of the heart's action ; but its efficiency is somewhat discounted by the fact that it causes a rise of blood-pressure.

Therapeutics.

Ergot is not to be relied on to any great extent in hæmorrhages from the mouth.

In cases of hæmophilia, or obstinate bleeding from any cause, the liquid extract may be used as follows :—

Rx.

Extracti Ergotae Liquidum ̄ ii.

Acidi Sulphurici Diluti m. xl.

Aquam Menthae Piperitae ad ̄ iv.

Misce. Fiat mistura.

Signa. Two tablespoonfuls every hour till the bleeding ceases.

Or the *hypodermic injection* may be used. This should be recently prepared ; it should be injected into the muscles, and not, as is usual, under the skin, as it is sometimes irritating.

Note. Avoid the use of ergot if the patient be pregnant.

Suprarenal Gland. Non-official.

Materia Medica.

The powdered and desiccated suprarenal capsule of sheep.

Dose. 2 to 6 grs.

Incompatibles. Alkalies.

Preparations. Non-official.

Suprarenal Extract (Dry). 1 gr. = 8 grs. gland substance.

Dose. $\frac{1}{2}$ to 3 grs.

Liquid Suprarenal Extract : strength, 1 = 1 of fresh gland.

Dose. 10 to 15 mins.

Adrenalin : Active principle of suprarenal gland in grey crystals ; with difficulty soluble, consequently one of the following to be preferred :—

Adrenalin Chloride Solution. 1 in 1000 ; with .8% Sodium Chloride and .5% Chlorctone added.

Dose. 5 to 30 mins. (dilute 10 times for hypodermic injection).

Put up by Martindale & Co. in sealed glass capsules containing 10–15 m.

Hemisine. (B. W. & Co.) A dry soluble preparation of the active principle, from which solutions may be quickly prepared.

Dose (internally) $\frac{1}{200}$ to $\frac{1}{64}$ gr.
(hypodermically) $\frac{1}{30}$ gr.

Renaglandin, *Adnephrein*, *Paranephrein*, and *Renostypticin* are similar preparations. *Suprarenin* and *Epinine* are syuthetic preparations and may be boiled. Liquid suprarenal preparations quickly deteriorate, more especially if exposed to the light. They should therefore be kept in tightly sealed bottles of dark glass, or sealed glass capsules containing a single dose. Tablet preparations seem to undergo deterioration more slowly.

Pharmacology.

HÆMOSTATIC, STIMULANT OF NON-STRIPED MUSCLE.

The natural active principle exists only in the medulla of the suprarenal glands. Small quantities secreted and finding their way into the general circulation appear to be intimately connected with the functions of the sympathetic nerves, as removal of both suprarenals causes paralysis of these. The artificial addition of small quantities of the active principle to the circulation by intra-venous injection stimulates the sympathetic nerves, and consequently excites contraction of non-striped muscle fibre all over the body. The most marked effects are produced on the circulatory system, even by a dose so small as $\frac{1}{300}$ grain of gland substance. With an ordinary dose there is rise of blood-pressure, acceleration (later secondary slowing and even arrest) with strengthening of heart-beat. Other muscular effects have been observed, such as contraction of uterus and spleen, protrusion of eyeball, and inhibition of muscular functions in alimentary tract.

Applied locally, either by hypodermic injection, or directly where small vessels are fairly accessible (as to a mucous membrane or raw surface), the blood-vessels are powerfully constricted, and consequently the *hæmostatic* action well marked. From the absence of caustic effect it is to be preferred to metallic styptics. There is no direct action on the blood.

Therapeutics.

HÆMOSTATIC. Suprarenal gland is *not* a drug to be administered internally for the control of hæmorrhage (save in cases where its local action is desired in the upper part of alimentary tract), owing to the rise of blood-pressure and cardiac effects produced.

Thus it would prove especially dangerous to patients suffering from aneurism, apoplectic subjects, or those with dilatation of the heart.

For local application Adrenalin Chloride, or a freshly made solution of one of the dry products, should be employed.

Watery solutions are unstable and will not last more than two days. The natural active principle is destroyed by alkalies or prolonged boiling.

For arresting capillary hæmorrhage a **20%** solution of gland substance, or solution of Adrenalin Chloride 1 in 1000, may be applied to the part, with pressure, for a few minutes, when the vessels will contract and hæmorrhage cease. The liquid extracts, solutions of hemisine, or adrenalin chloride solution well diluted may be injected into the tissues, or packed against them for a few minutes before minor operations involving hæmorrhage, when the bleeding will be very greatly reduced. This may prove of great use when extracting difficult and buried roots, or many teeth at one sitting; also in fitting collar crowns, removing small polypi, etc.

Suprarenal extract has proved of service as an adjuvant to the production of local anæsthesia by subcutaneous injection, by—

- (i.) Increasing local anæsthetic effect; contraction of vessels hindering absorption of anæsthetic drug into circulation, so prolonging local action.
- (ii.) Reducing liability to poisoning, by similar means.
- (iii.) Lessening hæmorrhage.

In general surgery large quantities of very dilute solutions (Adrenalin Chloride 1 in 100,000) have been employed in this connection, but in Dental Surgery, where the area to be infiltrated is much more limited, less dilute solutions may be used. Thus to 20 mins. of a 4% solution of novocain may be added $\frac{1}{1000}$ gr. of suprarenin borate.

The pain arising from the pressure of inflammatory congestion can be temporarily mitigated by an injection of suprarenal extract, but the practice is not to be recommended (see Pharmacology).

Its action in cases of hæmophilia is doubtful.

ANTISEPTICS, DISINFECTANTS, AND DEODORANTS.

An **Antiseptic** is that which prevents or arrests the growth of micro-organisms (germs).

A **Disinfectant** is that which destroys micro-organisms.

A **Deodorant** is that which destroys foul odours.

The greatest advance of modern times was made in general surgery by the introduction of antiseptic methods in the treatment of wounds. "Antiseptic" surgery, however, has since, to a large extent, been superseded by "Aseptic," which aims at the perfect sterilisation of instruments, hands, and operation site, and to the **prevention** of infection by micro-organisms, rather than the inhibition or destruction of these by chemicals.

In the present state of our knowledge aseptic methods are not so generally applicable in dental as in general surgery, and antiseptics have to be relied upon to a great extent by the dentist; though, when possible, aseptic methods should always be adopted.

The agents employed under this heading in dentistry comprise :—

1. Heat.

All pathogenic micro-organisms are destroyed by boiling for five minutes, and non-spore bearing germs by a temperature of 60°C . for 10 minutes. Lower temperatures or for shorter times are not safe disinfectants. All instruments brought in contact with wounded vascular tissues, such as forceps, scalers, etc.,

should therefore be boiled before being used on another patient. Any instrument brought in contact with a patient suffering from a specific infectious disease should be boiled.

It is not necessary to boil mirrors, excavators, burnishers, etc.; a thorough mechanical cleansing and the use of lysoform or lysol being efficient and more convenient.

Such physical agents as cold, desiccation, electricity, pressure and agitation, as means capable of destroying or inhibiting the growth of germs, are of little practical use to the dentist, and are not dealt with in this book.

2. Drugs.

Germs are living vegetable organisms. In order to destroy them, or inhibit their growth, the disinfectants or antiseptics used must—

touch them
for a definite time,
must be of a definite strength and
chemically unaltered.

The value of drugs as disinfectants or antiseptics will vary according to :—

1. The nature of the materials surrounding or associated with the germs.
2. The kind and condition of the germs.
3. The presence or absence of spores.
4. Temperature.
5. The number of germs present.
6. The length of time the drug is allowed to act.
7. The concentration of the drug.
8. The toxic and corrosive action of the agents.

Many germs have a gelatinous covering, and most germs are mixed up with *débris* of various kinds, so that mechanical cleansing is a great aid to disinfection. Also it is important for the drug to be able to penetrate quickly into the mass to be disinfected. A drug much diluted by saliva, blood, or pus may

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be too weak to be efficient. Some drugs are chemically altered by the media surrounding the germs, and become inert. **Example.**—Mercuric chloride is precipitated by albuminous fluids.

Many disinfectants are **caustic**, and all are more or less irritants ; therefore, it is very necessary to be careful in their use. Healing may be arrested or tissues killed by the application of strong irritants, and thus a more favourable site for germ growth produced on the washing away or neutralisation of the drug. Healthy living tissues and fresh blood serum are inimical to the activity or vitality of micro-organisms.

The penetrating power of a disinfectant will depend upon :—

- (a) The drug, its solubility, visciduity, diffusibility, and its chemical reaction with the tissues.
- (b) The solvent used, its visciduity, diffusibility, its chemical reaction with the fluids of the part.
- (c) The material to be penetrated, its density, chemical and physiological reaction, and surface tension towards the drug and solvent used. Also any preparatory treatment it may have undergone.
- (d) The method of application, the care with which contact is ensured, the exclusion of moisture or saliva, and the use of pressure or electric currents (see pp. 101, 175).
- (e) The time during which the application lasts.
- (f) The movements of the tissues and the circulation of the fluids within them.

In selecting a disinfectant for any particular case all the above conditions must be thought of, and the most suitable drug, solvent, and concentration chosen.

ANTISEPTICS, DISINFECTANTS AND DEODORANTS. 67

For disinfectants for **root-canals** one must take into consideration their :—

1. Germicidal power.
2. Penetrating power.
3. Rapidity and permanency of action.
4. Effect on instruments.
5. Smell.
6. Irritant action.
7. Solvent and the stability of solutions.
8. Liability to stain the tooth.

Deodorants.

Bad odours may arise from the presence of evil-smelling bodies, such as stale **tobacco** and **excretions** from the mucous membrane, but is more often the result of **putrefaction**; hence disinfectants are also often used as deodorants. Drugs having a powerful **oxidising action** are also much used as deodorants, the oxygen combining with the ill-smelling body to form a new odourless and usually less harmful substance.

Concealing one smell by another is not deodorising, and is bad practice. It should never be forgotten that **cleanliness** is the first and most essential step towards disinfection or deodorising.

Hydrargyri Perchloridum. PERCHLORIDE OF MERCURY. HgCl_2 .

Materia Medica.

Synonyms. Corrosive sublimate, hydrargyrum chloridum corrosivum, bi-chloride of mercury.

Dose. $\frac{1}{32}$ to $\frac{1}{16}$ gr.

Solubility.

- 1 in 16 of water,
- 1 „ 3 „ alcohol,
- 1 „ 2 „ glycerine.

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Incompatibles. Soap, alkalies, tannin, albumin ; destroys steel instruments.

Preparations.

Liquor Hydrargyri Perchloridi. 1 in 875.

Dose. $\frac{1}{2}$ to 1 dr.

Sal Alembroth. Non-official.

Equal parts of mercuric and ammonium chlorides.

Pharmacology.

ANTISEPTIC, DISINFECTANT, CAUSTIC,
ANTISYPHILITIC.

ANTISEPTIC AND DISINFECTANT. The metallic salts act as disinfectants by coagulating and combining with the protoplasm of the germs, as with that of other cells, and hence their action will be greatly reduced in the presence of other proteids.

Mercuric salts have in addition a specific influence on germs, which is the chief cause of their efficiency. The perchloride is ANTISEPTIC in a strength of 1 in 15,000 and is DISINFECTANT 1 in 1000. Albuminate of mercury is soluble in an excess of albumin, and is disinfectant.

CAUSTIC. Not used in dentistry.

ANTISYPHILITIC. See p. 171.

All preparations of mercury exert a specifically destructive or inhibitory action upon the spirochaeta pallida or germ of syphilis. When dealing with a known case of secondary syphilis, in which stage the secretions of the mouth are extremely infective, it is a useful precaution for the dentist to rub the hands with a mercurial ointment (see p. 174), in order to prevent infection.

Therapeutics.

ANTISEPTIC AND DISINFECTANT. The numerous incompatibles are the chief objections to the use of mercuric chloride. These objections may, to a certain extent, be overcome by adding an equal quantity of sodium, potassium, or ammonium chloride to the solution, as they render the salt less precipitable by albumin, more soluble, and less irritating. The combination with *Ammonium Chloride* is known as *Sal Alembroth*, and is used for dressings. Mercuric chloride acts quickly and in very dilute solutions, but penetrates poorly, and the nature of surrounding tissues must always be borne in mind. Its toxicity and evil taste are much against its use as a gargle, though a 1 in 2500 solution is the quickest and most effectual disinfectant mouth-wash known. A 1 in 1000 solution has been recommended for syringing out pyorrhœa pockets after proper previous cleansing (a platinum syringe must be used).

For the treatment of root-canals, 1 in 500 is a powerful and lasting disinfectant, but easily precipitated and so prevented from penetrating. It is destructive to steel instruments, without smell, not liable to cause irritation, and sufficiently soluble. It is said to stain the tooth dark, but this is not liable to happen unless from the use of steel instruments or the presence of some other impurities.

A solution of *Mercuric Biniiodide* HgI_2 , which is soluble in Perchloride of Mercury solution, or that of other iodides, is frequently employed in general surgery as an antiseptic lotion for the hands during operations, and may be employed in the strength of 1 in 4000.

As a mouth-wash—

R.

<i>Liquoris Hydrargyri Perchloridi</i>	℥ iss.
<i>Tincturae Calendulae</i>	℥ iv.
<i>Aquam</i>	ad ℥ iv.

Misce. Fiat collutorium.

Signa. The mouth-wash.

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Toxicology.

2 grs. have killed a man in half an hour.

Symptoms of poisoning.

Strong metallic taste.

Constricting and burning pain in the throat and stomach.

Vomiting (white and slimy), purging, tenesmus.

Collapse.

Treatment.

Give albumin (milk, white of egg).

Wash out the stomach.

Brandy and opium.

Argenti Nitras. See p. 20.

Pharmacology and Therapeutics.

CAUSTIC, ASTRINGENT, ANTISEPTIC, DISINFECTANT.

ANTISEPTIC AND DISINFECTANT. Very weak solutions (1 in 12,000) are ANTISEPTIC, and the exposed roots of teeth which have been cauterised with silver nitrate appear to resist caries for a long time when kept clean. It acts in a similar manner to the other metallic salts. (See p. 68.) 1 in 2000 is DISINFECTANT to most germs. The staining action is the principal drawback to its use. It has been recommended, applied by means of pieces of blotting paper saturated with a 40% solution, as a dressing under fillings, and in children's teeth may be of use, but the marked staining produced contra-indicates its employment for permanent teeth.

For ionic medication use a 1% solution. Silver is cationic (see p. 101).

Cupri Sulphas. See p. 33.

Pharmacology and Therapeutics.

CAUSTIC, ASTRINGENT, STIMULANT, ANTISEPTIC
DISINFECTANT.

ANTISEPTIC AND DISINFECTANT. Copper sulphate is a very good astringent disinfectant, having a similar action to the other metallic salts. (See p. 68.) It has long been a favourite application for the disinfection of *pyorrhœa* pockets. The presence of albumin greatly reduces its power, but an 8% solution should be DISINFECTANT in the mouth, in the absence of spores, whilst a 1% solution is ANTISEPTIC. The stimulant and astringent actions are valuable aids in the treatment of stomatitis, and, but for its taste and staining action, it would be very useful.

For ionic medication use a 2% or 3% solution. Copper is cationic (see p. 101).

For prescription see p. 35.

Zinci Chloridum. See p. 18.

Pharmacology and Therapeutics.

CAUSTIC, ASTRINGENT, STIMULANT, ANTISEPTIC,
DISINFECTANT.

ASTRINGENT AND DISINFECTANT. Zinc chloride is a weak disinfectant ; even in 5% solutions it sometimes fails to destroy germs after prolonged contact. Its antiseptic action is made use of in the form of the **Oxychloride cement**, which contains free zinc chloride, and may be used for filling roots, fixing crowns, or lining cavities not in close proximity to a live tooth pulp. Zinc chloride is antiseptic 1 in 500.

For ionic medication use a 2% or 3% solution. Zinc is cationic (see p. 101).

For prescription see p. 39.

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Acidum Boricum. BORIC ACID, H_3BO_3 .

Materia Medica.

Synonym. Boracic acid.

Dose. 5 to 15 grs.

Solubility.

1 in 30 of water,
1 ,, 28 ,, alcohol,
1 ,, 4 ,, glycerine.

Preparations.

Glycerinum Acidi Borici (B.P.) 1-3½.

Glyceritum Boroglycerini (U.S.P.) 31% boric acid.

Boroglyceride (Barff). Non-official.

Pharmacology and Therapeutics.

A saturated 4% tepid solution of boracic acid is a mild ANTISEPTIC, with little irritant action, and is very useful for flushing out an inflamed antrum.

For prescription see p. 46.

The powder forms a useful antiseptic dusting powder.

Sodii Biboras. BORAX. See p. 169.

Is an alkaline borate, with slightly greater antiseptic action than boric acid.

For prescriptions see pp. 38, 91, 97.

Potassii Permanganas. PERMANGANATE OF POTASH. KMnO_4 .

Materia Medica.

Dose. 1 to 3 grs.

Solubility.

1 in 18 of water.

Decomposed by alcohol.

Incompatibles. Soap, organic bodies.

Preparations.

Liquor Potassii Permanganatis, 1 in 100.

Dose. 2 to 4 drs.

Condy's Fluid. Non-official. 32 grs. to the pint.

Dose. 5 mins.

Pharmacology.

CAUSTIC, ASTRINGENT, DEODORANT, ANTISEPTIC, DISINFECTANT.

CAUSTIC AND DISINFECTANT. Strong solutions of permanganate of potash, like all oxidising agents, act as caustics and disinfectants by the rapid liberation of oxygen when brought in contact with organic bodies, the oxygen at once combining with the tissues, germ protoplasm, or products to form simpler unorganised bodies.

ASTRINGENT, DEODORANT AND ANTISEPTIC. Weak solutions (1 in 1000) are astringent, and, by oxidising the products of putrefaction, rapid and effective deodorants and weak antiseptics.

Therapeutics.

CAUSTIC. Not used in dentistry.

DISINFECTANT.—The burning and staining produced by strong solutions preclude their use in the mouth. They may be used for disinfecting the hands, these being immediately afterwards bleached with *oxalic acid or sulphite of soda*.

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ASTRINGENT, DEODORANT, ANTISEPTIC. The principal use of permanganate is as a **deodorant**, for which it is both rapid and effective in 0·1% solutions; the accompanying astringent and antiseptic actions are weak, but usually beneficial.

In hospital practice it is usual to direct the patient to buy a pennyworth of permanganate of potash and dissolve a crystal in enough water to form a elaret-coloured solution. The patient should be warned not to touch the crystals with damp fingers.

Solutions quickly oxidise and become brown if exposed to the air and dust.

Hydrogenii Peroxidum. PEROXIDE OF HYDROGEN. H_2O_2 .

Materia Medica.

Preparations.

Liquor Hydrogenii Peroxidi.

Dose. $\frac{1}{2}$ to 2 drs.

Is slightly acid (due to the addition of H_2SO_4 to preserve it).

Contains from 9 to 11 volumes of available oxygen per volume; it is readily decomposed and difficult to keep.

Perhydrol (Merck). Non-official.

A 30% watery solution of peroxide of hydrogen (100 vols. of available oxygen per vol.), free from acid.

Pyrozone. Non-official. See p. 137.

Pharmacology.

ANTISEPTIC, DISINFECTANT, BLEACHING AGENT
STYPTIC, CAUSTIC (in strong solution).

ANTISEPTIC AND DISINFECTANT. Acts by the liberation of oxygen.

BLEACHING AGENT. See p. 137.

STYPTIC. See p. 57.

Therapeutics.

ANTISEPTIC AND DISINFECTANT. Peroxide of hydrogen is antiseptic in very dilute solutions, and is used for cleansing pyorrhœa pockets; its slight acid reaction has made it popular for cleansing teeth, but this is a dangerous principle to follow.

As a root-canal dressing the *Liquor Hydrogenii Peroxidi* is an efficient germicide, and the oxygen, its active ingredient, will penetrate very well, and by bubbling indicate its activity. There is no precipitation of albumin, and some claim that the *débris* is partly removed by the escaping gas. Peroxide of hydrogen quickly loses its power; it has no ill effects on instruments, no bad smell, taste, nor irritant action; it does not stain the tooth (rather the reverse); solutions keep very badly.

Pyrozone and Merck's Solution are too caustic and penetrating for root treatment unless used with great caution.

As a mouth-wash—

R.

<i>Liquoris Hydrogenii Peroxidi</i>	3 iv.
<i>Tincturae Calendulae</i>	3 ij.

Misce. Ft. collutorium.

Signa. The concentrated mouth-wash. A tablespoonful to be added to a wineglassful of water.

CAUSTIC. Not used.

Sodii Peroxidum. PEROXIDE OF SODIUM. Na_2O_2 .

Materia Medica.

Characters. A strongly alkaline, caustic, deliquescent white solid.

Solubility.

Sodium peroxide is a white solid which is soluble in water, but if added in bulk so much heat is

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generated that the oxygen is liberated, and the solution decomposes. In preparing solutions it is very necessary to add the drug in very small quantities at a time, and to keep the solution cool.

Pharmacology.

ANTISEPTIC, DISINFECTANT, BLEACHING AGENT, SOLVENT, CAUSTIC.

ANTISEPTIC AND DISINFECTANT. Sodium peroxide acts by liberating oxygen, and also by the formation of caustic soda.

BLEACHING AGENT. See p. 137.

SOLVENT. The evolution of gas may help to cleanse root-canals, and the caustic soda is a solvent of fatty *débris*.

CAUSTIC. Due to the rapid evolution of oxygen and presence of caustic soda.

Therapeutics.

ANTISEPTIC, DISINFECTANT, AND SOLVENT. A 50% solution is a useful cleansing and disinfecting agent for root-canals. It is efficient and penetrating; its action is soon neutralised, when the soapy remnant should be washed away with warm water. It does not destroy instruments, has no smell, and will not stain the teeth. Solutions are liable to degenerate, but not so freely as peroxide of hydrogen, and it is always necessary to use the rubber-dam to prevent its caustic action on the tissues.

Other drugs liberating oxygen in a similar way are: Benzoyl-Acetyl-Peroxide (Acetozone), Calcium Peroxide CaO_2 (contained in a proprietary dentifrice called Calox), and Magnesium Peroxide (known under the trade names of Biogen, Hopogan, Magnesium Perhydrol, contained in a proprietary dentifrice called Perhydrol Tooth Powder).

Iodum.

Materia Medica.

Characters.

Rhombic prisms, of peculiar odour, dark colour and metallic lustre.

Solubility.

1 in 7000 of water,
1 ,, 12 ,, alcohol,
1 ,, 65 ,, glycerine,
but freely soluble in solutions of potassium iodide.

Preparations.

Liquor Iodi Fortis (B.P. 12%). Not given internally. (The old Liniment.)

Tinctura Iodi (B.P. 2½%). Dose. 2 to 5 mins.

Tinctura Iodi (U.S.P. 7%). Dose. 1 to 5 mins.

Liquor Iodi Compositus (U.S.P. 5%).
(Lugol's solution.) Dose. 1 to 10 mins.

Pharmacology.

IRRITANT, ANTISEPTIC, DISINFECTANT, ALTERATIVE, BLEACHING AGENT.

ANTISEPTIC AND DISINFECTANT. Iodine acts by precipitating the protoplasm, and entering into loose chemical combination with it. Owing to its volatility it penetrates deeply. 1 in 50 is DISINFECTANT, and 1 in 4000 ANTISEPTIC.

Therapeutics.

ANTISEPTIC AND DISINFECTANT. Iodine is a powerful disinfectant, and as the *liquor* or *tincture*, when applied over the roots of teeth as a counter-irritant, probably has a secondary beneficial effect by disinfecting the gum pockets around the neck of the tooth.

In general surgery an alcoholic solution of iodine is now much used for skin preparation before operation.

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It is applied to the dry skin, and is an effective surface disinfectant if moisture be excluded.

As a **root-canal** disinfectant it is an effectual germicide ; its volatility causes it to penetrate well, but not to be permanent. It destroys instruments, and stains most tissues deeply. It is an irritant. The stains may be removed by ammonia.

For ionic medication use a 2% or 3% solution. Iodine is anionic (see p. 101).

Toxicology.

10 grs. of iodine have killed a man.

Symptoms of poisoning.

Burning pain in mouth, throat, and stomach.

Vomiting (brown), diarrhoea.

Thirst, headache, faintness.

Collapse.

Treatment.

An emetic of warm water, stomach-pump.

Starch (flour, potato).

Iodoformum. IODOFORM. CHI_3 .

Materia Medica.

Source. Produced by the action of iodine on alcohol in the presence of potassium carbonate.

Dose. $\frac{1}{2}$ to 3 grs.

Solubility.

Slightly in water,

1 in 80 of alcohol,

1 „ 5 „ ether,

1 „ 14 „ chloroform.

Freely soluble in fixed and volatile oils.

Composition. Contains about 96% of iodine.

Pharmacology.

ANTISEPTIC, DISINFECTANT (?), LOCAL ANÆSTHETIC, MUMMIFYING AGENT.

ANTISEPTIC AND DISINFECTANT. Germs have been known to live in a strong solution of iodoform, and wounds have been infected by the use of the dry powder. Iodoform only appears to act by becoming decomposed and setting free iodine. The vapour of iodoform inhibits the growth of some micro-organisms.

LOCAL ANÆSTHETIC. Iodoform acts as a direct sedative to nerve endings.

MUMMIFYING AGENT. See p. 47.

Therapeutics.

ANTISEPTIC. It is used in surgery, partly for its mechanical effect in drying up discharges and as a non-irritant antiseptic. Solutions in ether have a decided action against the tubercle bacillus. It is decomposed by the discharge from wounds, and gives off iodine.

In the mouth iodoform is very objectionable on account of its taste and smell, but on account of its non-irritant antiseptic qualities it is often used, principally as *iodoform gauze*, to pack sinuses, etc.

As a **root dressing** it is a doubtful disinfectant, and a mild antiseptic with very little penetrating power; it is fairly permanent, does not destroy instruments, or stain the tooth. It has a persistent, penetrating, unpleasant odour, but is non-irritant.

A few cases of acute temporary irritation, following the use of iodoform as a root dressing, have been observed, possibly due to the liberation of free iodine.

A mummifying paste may be prepared as follows :—

Take of

<i>Iodoform</i>	60 grains.
<i>Tannic Acid</i>	10 „
<i>Liquefied Carbolic Acid</i>	a sufficiency.

Let a paste be made.

For covering the smell of iodoform the addition of 1% each of *Coumarin* and *Otto of Roses* is very serviceable. The smell of iodoform may be removed from the hands by a watery solution of tannic acid, chloroform, ether, or soap liniment.

Toxicology.

Iodoform may be absorbed from a large wound and cause poisoning.

Symptoms of poisoning.

An eruption on the skin.

Vomiting, fever, delirium and collapse.

Treatment.

Discontinue the drug, and give stimulants if necessary.

Iodol. TETRA-iodo-PYRRHOL. C_4I_4NH . Not official.

Materia Medica.

Solubility.

Insoluble in water.

Soluble in alcohol, ether, chloroform.

Pharmacology and Therapeutics.

It is an odourless substitute for iodoform, having much the same action. It is not toxic. Is powerfully deodorant, hence is a useful dressing for septic roots.

The following drugs also belong to this class and have similar properties and actions: Aristol, Traumatol (Iodo-cresol), Airol, Di-iodoform, Europhen, Iodoformal, Loretin, Losophan, Nosophen, Sanoform, Soziodol, Di-iodo-salicylic acid.

All unofficial, and none containing so high a percentage of iodine as iodoform (96%) and iodol (90%).

Calx Chlorinata. See p. 43.

Chlorine, which is given off from solutions of this drug, acts similarly to iodine, and is a powerful disinfectant and deodorant. The *Liquor calcis chlorinatae* forms a useful antiseptic, stimulant and deodorant gargle, or mouth-wash. See p. 44.

Formic Aldehyde. Not official. HCOH.

Materia Medica.

Synonyms. Formalin, Formol, Formochloral, Formalith.

Solubility.

Mixes readily with water or alcohol, but not ether.

Incompatibles. Ammonia, alkalies, tannic acid, gelatin, iron preparations, and salts of copper, iron, or silver.

Preparation.

Formaline. Non-official.

40% solution of formic aldehyde.

Liquor Formaldehydi (U.S.P.) 37%.

Formaldehyde tablets. Non-official.

$\frac{1}{4}$ gr. paraform,
2 grs. milk sugar,
Citric acid, peppermint, and sugar to make
10 grs.

Formamint, a trade preparation, has a similar composition, and each 1-gramme tablet is said to contain .01 grammo of formaldehyde.

Paraform, a white, friable amorphous mass, slightly soluble in water, is a polymer of formic aldehyde, and is used in all solid preparations required to give off formic aldehyde.

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Lysoform. Non-official.

A combination of formic aldehyde with potash-soap and glycerine. Strength, 23% of commercial formaline. A yellow liquid with not unpleasant odour.

Pharmacology.

ANTISEPTIC, DISINFECTANT, IRRITANT,
MUMMIFYING AGENT.

Formic Aldehyde being volatile, all preparations containing it should be freshly prepared and not heated.

Therapeutics.

Formic Aldehyde solutions or vapour are powerful disinfectants, the latter also having the advantage of possessing about the same specific gravity as air, with which it therefore diffuses very evenly, and can so be used for the disinfection of rooms and delicate apparatus.

A 2% solution of *formaline* is a good fixing and hardening agent for pathological specimens. A solution of 1 in 10,000 is said to have a powerful germicidal action and 1 in 40,000 to be antiseptic. A 1% solution is a good general disinfectant, and on account of its powerful irritant and very lasting painful action this is as strong as it can be used in the mouth.

Its great penetrating power makes its employment in strong solutions, even in root treatment, dangerous. Formaline is a most excellent deodorant either for rooms or substances.

As an application to sensitive dentine, formaldehyde is used in the form of a temporary filling composed of *paraform* diluted with twenty times its weight of zinc oxide or other inert substance, made into a paste with gum and water. It should be left in about one or

two days. It acts by coagulating the dentinal fibrils, and if it is placed near the pulp, or a strong mixture left in for a long time, it will cause pain and may destroy the vitality of the pulp.

Lysoform is a preparation of formic aldehyde (of which it contains about 8%) eminently suited for dental work owing to its much less irritating properties and greater stability. It is especially useful in disinfection of hands and instruments, from its cleansing action; while in root treatment lysoform has proved an excellent deodorant and disinfectant, having the further advantages of being a good cleanser from *débris*, and lubricant of root-canals, facilitating the penetration of the latter by broaches, etc.

R.

<i>Liquoris Formaldehydi</i>	3	i.
<i>Olei Menthae Piperitae</i>	m.	iv.
<i>Spiritus Vini Rectificati</i>	3	ss.
<i>Aquam Menthae Piperitae</i>	ad 3	ii.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

Half a teaspoonful to be used with half a tumbler of water.

Toxicology.

Two ounces of formaline are known to have killed a man.

Symptoms.

Insensibility.

Collapse.

Suppression of urine.

Treatment.

Wash out stomach.

Dilute solutions of ammonia.

Stimulants.

Acidum Carbolicum. CARBOLIC ACID. C_6H_5OH .

Materia Medica.

Hydroquinone of Benzene from.

Synonyms. Phenol, Phenic acid.

Source. Obtained commercially from coal tar.
Chemically pure phenol is made synthetically from benzene and aniline oil.

Dose. 1 to 3 grs.

Solubility.

1 in 12 of water,
6 „ 1 „ alcohol,
 $3\frac{1}{2}$ „ 1 „ glycerine.

Freely in olive oil, chloroform, liquor potassae, and volatile oils.

Characters. Colourless hygroscopic crystals with a tarry odour (frequently pink from the formation of rosanilic acid); becomes and remains fluid on the addition of 10% of water. It does not redden blue litmus-paper.

Preparations.

Acidum Carbolicum Liquefactum (91 %).

Dose. 1 to 3 mins.

Glycerinum Acidi Carbolic, 1 in 5.

Pharmacology.

ANTISEPTIC, DISINFECTANT, CAUSTIC, LOCAL ANÆSTHETIC.

ANTISEPTIC AND DISINFECTANT. Carbolic acid causes a coagulation of the germ protoplasm, without entering into combination with it, and, being volatile, is thus able to penetrate more deeply than the metallic salts. It is ANTISEPTIC 1 in 300 and DISINFECTANT 1 in 20. It is unaffected by alkalies or soap. It will not destroy spores.

CAUSTIC. See p. 25.

LOCAL ANÆSTHETIC. See p. 116

Therapeutics.

ANTISEPTIC AND DISINFECTANT. Carbolic acid 1 in 20 applied for one minute will destroy all the pathogenic germs likely to be met with in the mouth. A solution of this strength applied to wounds is an irritant to the tissues, and causes much exudation. This is not prevented by its local anæsthetic action.

As an antiseptic mouth-wash, 1 in 250 carbolic is very useful, having a not unpleasant taste, and a local anæsthetic action which quickly follows the initial smarting sensation.

R.

<i>Liquoris Potassae</i>	3 vi.
<i>Acidi Carbolici Liquefacti</i>	3 iv.
<i>Tincturae Cocci</i>	q. s.
<i>Aquam</i>	ad. 3 iv.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

One teaspoonful in a wineglassful of water to be held in the mouth for three minutes, after proper brushing, three times a day.

R.

<i>Acidi Carbolici Liquefacti</i>	
<i>Tincturae Iodi</i>	aa. m. xlvij.
<i>Aquam</i>	ad 3 viij.

Misce. Fiat collutorium.

Signa. The mouth-wash.

For cleansing root-canals carbolic has the following advantages and disadvantages. It is an efficient germicide, 1 in 20 or pure; has no action on steel instruments, nor bad smell. It does not stain the teeth. It has only moderate penetrating power; it coagulates albumin. The strong drug will produce a local necrosis with any tissue with which it accidentally comes in contact; being volatile it is not durable as a dressing, and should not be left in for a prolonged period.

It is very valuable for the disinfection of instruments, **1** in **20**. It may also be used in the same strength for the disinfection of small wounds by direct application to the part, bearing in mind that it will increase exudation. Carbolic may be absorbed from dressings to large wounds and cause poisoning.

Watery solutions are more powerful than solutions in oil or glycerine.

CAUSTIC. See p. 25.

LOCAL ANÆSTHETIC. See p. 116.

Toxicology.

1 fluid drachm has killed a man.

Symptoms of poisoning.

Burning pain in mouth and stomach.

Vomiting (occasionally), dyspnoea.

Giddiness, weakness, and collapse.

Urine is suppressed, or, if passed, soon turns green, and then dark brown.

Treatment.

Wash out the stomach with *saccharated lime water*, and give $\frac{1}{2}$ oz. of *magnesium sulphate*.

Stimulants, warmth, and artificial respiration.

Should carbolic be accidentally dropped on the lip or cheek, at once rub the spot with *oil* or *glycerine* to dissolve it out.

Acidum Cresylicum. CRESYLIC ACID. Not official.

Synonyms. Crude cresol, cresyl, paracresylol, cresyl hydrate.

A mixture of ortho-, meta-, and paracresols, forming the principal constituent of crude carbolic acids.

Characters. A yellowish liquid with a tar-like odour.

Solubility. 1 in 70 water. Freely miscible in all proportions with alcohol 90%, chloroform, ether, and glycerine.

Preparations.

Tricresol (Not official). A purified mixture of the three cresols.

Lysol (Not official). A clear brown oily liquid with a phenolic odour. Contains 50% of free cresols dissolved in neutral potassium soaps. It is miscible with soft or distilled water in all proportions to a clear solution, which is soapy to the touch and froths on shaking. Mixed with hard water a cloudiness or curdiness results, which, however, is said not to affect its disinfectant properties. Incompatible with acids and cocaine.

Other Coal Tar Derivatives. See also p. 181.

Creolin. A dark-coloured liquid said to contain 20% cresylic acid.

Izal. A white emulsion obtained from coal oil.

Cyllin. A dark alkaline liquid prepared from coal tar, containing certain oxidised hydrocarbons with a diphenyl nucleus.

Pharmacology.

ANTISEPTIC AND DISINFECTANT. Cresol preparations are more powerfully disinfectant and less poisonous than phenol.

It is claimed that the disinfectant coefficient of lysol is from 3 to 6 times greater than that of carbolic acid, while it is 5 to 10 times less poisonous.

Therapeutics.

ANTISEPTIC AND DISINFECTANT. Cresol and the other preparations mentioned above are frequently used in dentistry for the disinfection of hands and instruments. Lysol, from its soapy nature, is of especial use in this respect.

Solutions of lysol in hard water (see above) have been known to clog the pipes of fountain spittoons from precipitation of the contained soaps.

Tricresol has been used as a dressing for foul roots of teeth.

with formalin.

Thymol. See p. 115. PROPYL-META-CRESOL.

ANTISEPTIC, LOCAL ANÆSTHETIC.

Therapeutics.

Thymol on account of its slight solubility and antiseptic action has been used to pack pulp cavities in dead teeth.

Creosotum. CREOSOTE.

Materia Medica.

Dose. 1 to 5 mins.

Source. Obtained by distillation of wood tar.

Characters. A colourless or brownish liquid, with a strong odour and burning taste.

Composition. A mixture in varying proportions of guaiacol, creasol, and other phenols; sometimes contains carbolic acid as an impurity.

Solubility. Sparingly in water; freely in alcohol or ether.

Incompatible. Oxide of silver, with which an explosive compound is formed.

Pharmacology.

DISINFECTANT, ANTISEPTIC, DEODORANT,
LOCAL ANÆSTHETIC.

Creosote has the same actions as carbolic acid, though, owing to its uncertain composition and strength, the latter is preferred for most purposes.

Therapeutics.

Creosote as a dressing for foul root-canals is similar to carbolic acid, but considerably more lasting in its effects. The odour is more unpleasant.

Beta-Naphthol. NAPHTHOL. One of the phenols of naphthalene. $C_{10}H_9OH$. Not official.

Materia Medica.

Dose. 3 to 10 grs.

Solubility.

1 in 1000 of water.

1 „ 2 „ alcohol.

1 „ 12 „ olive oil.

Preparations. **Hydronaphthol** (*a trade name*).

Light fawn-coloured crystals, with little odour or taste.

Characters. White shining crystals with a disagreeable odour.

Pharmacology.

Beta-naphthol acts in a similar manner to carbolic acid.

Therapeutics.

DISINFECTANT AND ANTISEPTIC. Beta-naphthol is a powerful antiseptic in saturated watery solutions.

As a disinfectant for carious cavities and dead teeth, beta-naphthol must be used with due regard to its solubility. It has no penetrating power in moist dentine, but if the dentine is first dehydrated with alcohol, and an alcoholic solution **1 in 100** used, it will penetrate sound dentine freely, and disinfect as it goes. For root-canals it is an efficient germicide, very penetrating (in dry dentine) and permanent; it has no effect on steel instruments; has a warm taste, no smell, and is non-irritant. It should be dissolved in alcohol.

90 ANTISEPTICS, DISINFECTANTS AND DEODORANTS.

Cotton-wool which has been dipped in a 1% alcoholic solution of hydronaphthol and then dried is less liable to become foul when used with gum mastic as a dressing.

Acidum Benzoicum. BENZOIC ACID. C_6H_5COOH .

Materia Medica.

Source. Prepared by sublimation from Styrax Benzoin.

Dose. 5 to 15 grs.

Characters.

White feathery crystals with agreeable odour and warm acid taste.

Solubility. 1 in 400 of water,
1 „ 3 „ alcohol,
1 „ 30 „ glycerine.

The addition of borax increases the solubility in water.

Preparation (of Gum Benzoin).

Tinctura Benzoini Composita (Friar's Balsam).

Dose. $\frac{1}{2}$ to 1 dr.

Pharmacology.

ANTISEPTIC, DISINFECTANT, CAUSTIC.

Benzoic acid has a similar action to that of carbolic acid, but is less penetrating because less volatile. It is ANTISEPTIC 1 in 900, and DISINFECTANT 1 in 100, this latter strength being too caustic to be used in the mouth except on the brush.

Therapeutics.

Benzoic acid or its salts are used as an ingredient in antiseptic and disinfectant mouth-washes and antiseptic tooth-pastes.

R.

<i>Sodii Bicarbonatis</i>	3 jss.
<i>Boracis</i>	3 jss.
<i>Sodii Benzoatis</i>	gr. iv.
<i>Sodii Salicylatis</i>	gr. iv.
<i>Eucalyptol</i>	gr. ij.
<i>Thymol</i>	gr. ij.
<i>Menthol</i>	gr. i.
<i>Olei Gaultheriae</i>	m. i.
<i>Aquae</i>	3 xij.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be diluted with an equal amount of water.

Burroughs, Wellcome & Co.'s "Soloid" Nasal
(Eucalyptia Compound).

R. (Miller's)

<i>Tincturae Krameriae</i>	m. xv.
<i>Acidi Benzoici</i>	gr. x.
<i>Glusidi</i>	gr. vi.
<i>Olei Menthae Piperitae</i>	
<i>Olei Cinnamomi</i>	āā. m. ij.
<i>Alcohol</i> (90%)	ad 3 i.

Misce. The concentrated mouth-wash.

30 drops to be added to half a tumbler of water.

Acidum Salicylicum. SALICYLIC ACID.

$C_6H_4 OHCOOH$. See p. 91.

Materia Medica.

Source. Obtained from *Gaultheria procumbens*, or synthetically from the combination of carbolic and carbonic acids.

Characters. Yellowish crystals, inodorous, irritant to nostrils, taste sweetish, then acid.

Dose. 5 to 30 grs.

Solubility. 1 in 600 of water, readily in alcohol, ether, glycerine or hot water.

The addition of borax increases the solubility in water.

Pharmacology and Therapeutics.

ANTISEPTIC, DISINFECTANT, CAUSTIC.

The action and uses of salicylic acid are almost identical with those of benzoic acid.

Combinations of carbolic and salicylic acids, of which *salol* is an example, have been extensively employed as antiseptic mouth-washes. Their long-continued use is liable to cause irritation of the mouth.

Eucalypti Oleum. EUCALYPTUS OIL.

Materia Medica.

Dose. $\frac{1}{2}$ to 3 mins.

Source. The oil distilled from fresh leaves of *Eucalyptus Globulus* and other species of *eucalyptus*.

Solubility. 3 in 1 of alcohol.

Pharmacology and Therapeutics.

ANTISEPTIC, DISINFECTANT, ANTIPERIODIC,
PERFUMING AGENT.

As a disinfectant for root-canals, eucalyptus is a feeble germicide. It is viscid and does not penetrate well; is a solvent of gutta-percha, and if sealed in by this only it will constantly leak out into the mouth, where its continual presence is nauseating. It is non-irritant, has no action on instruments, and does not stain the tooth. Its odour is liable to hide that due to putrefaction.

Aromatic Oils

Such as *Clove*, *Cinnamon*, *Peppermint* and *Cajuput*, are all mild ANTISEPTICS AND DISINFECTANTS, but their action is not quick enough to be of much use. Their stimulant and anæsthetic actions are more important; the fact that they are also antiseptic and even mildly disinfectant is a fortunate addition.

ANTACIDS.

Antacids are applications which neutralise abnormal acidity of the mouth.

In works on general pharmacology the term antacid is generally applied to remedies which, given internally, reduce the acidity of the contents of the stomach.

In contending against pathological acidity of the oral cavity, a condition which is a fertile cause of caries, prophylactic (preventive) measures are of the first importance. The chief of these is **cleanliness**. By removing fermentable matter, and reducing the number of organisms, acid fermentation, the chief cause of acidity in the mouth, is prevented.

In many general diseases an acid condition of the mouth is likely to arise. The commonest condition is dyspepsia (either primary or depending on some other cause, such as pregnancy), when acid regurgitations are likely to occur; the suitable treatment of the dyspepsia will remedy the effect.

In all acute illnesses, especially the specific fevers, much fermentation and acidity, very destructive to the teeth, frequently occurs.

This is due partly to abnormal secretions, partly to the absence of the natural cleansing action of the solid food and masticatory movements, and partly to the fact that the staple of the diet is milk, which quickly undergoes acid fermentation.

In acute illnesses, therefore, careful cleansing of the mouth by the patient, or nurse, is more than ever essential.

The most readily acidly fermentable foodstuffs are boiled vegetables, sticky sugary compounds, and sticky starchy foods.

Antiseptics as preventing fermentation, and sialagogues by producing a free flow of alkaline saliva, act as antacids.

The drugs employed to directly neutralise the acids of the mouth are alkalies, but the drawback to their efficiency lies, not in the weakness of their action, but in the shortness of the time they remain in the mouth, their lack of penetration, and their effect in reducing the quantity and alkalinity of the saliva (see p. 118).

Chalk, being insoluble, will penetrate least, and by lodging between the teeth and gums may mechanically do more harm than good. Though it is insoluble in water, the chalk combines with acids to form neutral salts. It reduces the amount of alkali in the saliva.

Liquor potassae and the more soluble alkalies penetrate well and act vigorously, but are quickly washed away.

Hence the magnesium salts are the most effectual applications, as they are but slightly soluble.

An effectual antacid, by arresting or slowing the progress of caries, will appreciably reduce the sensitiveness of shallow cervical cavities in a few weeks.

It must not be forgotten that a too free or prolonged use of alkaline washes may lead to the rapid formation of tartar.

Potassii Hydras. See p. 23.

Pharmacology and Therapeutics.

CAUSTIC, ANTACID, SOLVENT.

Weak solutions, 1 in 200, of caustic potash are used as a mouth-wash, usually in combination with carbolic acid (see p. 85), with the object of dissolving

away the mucus, fat, and dead epithelial cells, and so cleansing the mouth. This action permits other drugs, and the tissues, to act at greater advantage.

Dilute *Liquor Potassae* is a powerful and penetrating antacid, but is quickly washed away by the saliva.

Magnesiae Carbonas Ponderosa. MAGNESIUM
HYDRO-CARBONATE. $3 (\text{MgCO}_3)$, $\text{Mg}(\text{HO})_2$, $4 (\text{H}_2\text{O})$.

Materia Medica.

Dose. 5 to 30 grs.

Solubility.

1 in 9000 of cold water.

Slightly soluble, when freshly precipitated, in water charged with carbonic acid, forming—

Preparation.

Liquor Magnesii (B.P.). 10 grs. to 1 oz.

Emulsio Magnesiae. Non-official. 13 grs. of MgHO_2 to 1 oz.

Pharmacology and Therapeutics.

The heavy hydro-carbonate of magnesia is an active antacid, and being very slightly soluble in water it is not readily washed away, but remains in the mouth for some time; hence it is the most efficient
DIRECT ANTACID.

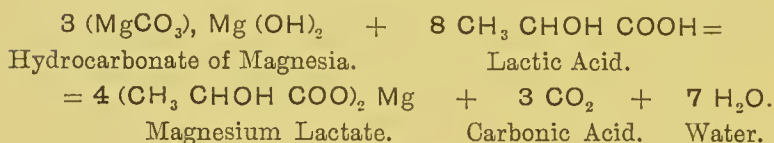
Milk of Magnesia and *Maglactis* are proprietary names for emulsive preparations containing the hydrate of magnesia. $\text{Mg}(\text{HO})_2$.

They may be prepared by the interaction of magnesium sulphate and solution of ammonia and

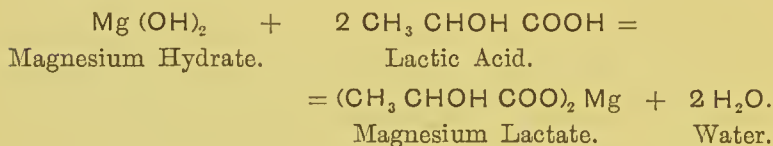
collecting the precipitate, which is washed with distilled water until the washings cease to give a reaction for sulphates.

A teaspoonful of the milk of magnesia may be spread over the teeth the last thing at night.

The formula for the interaction between the hydrocarbonate and lactic acid is



And for that between magnesium hydrate and lactic acid—



Sodii Bicarbonas. SODIUM BICARBONATE.

NaHCO_3 .

Materia Medica.

Dose. 10 to 60 grs.

Solubility.

1 in 12 of water.

Insoluble in alcohol.

Pharmacology and Therapeutics.

Bicarbonate of soda has an action similar to, but weaker than, caustic potash; and is sometimes used as an ingredient of antiseptic and alkaline mouth-washes. It is more alkaline and less unpleasant to

the taste than the carbonate (Na_2CO_3). The following is a mild and useful prescription :—

R.

<i>Sodii Bicarbonatis</i>	gr.	xx.
<i>Acidi Carbolici</i>	gr.	ii.
<i>Sodii Biboratis</i>	gr.	xx.
<i>Aquae</i>	$\frac{3}{4}$	iv.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be diluted with an equal amount of water.

Calcii Hydras. HYDRATE OF CALCIUM. $\text{Ca}(\text{OH})_2$.

Materia Medica.

Synonym. Slaked lime.

Solubility.

Slightly soluble in water (1 in 900).

Much more soluble in a solution of sugar.

Preparations.

Liquor Calcis (lime water), 1 in 900.

Dose. 1 to 4 ozs.

Liquor Calcis Saccharatus, 1 in 62.

Dose. 20 to 60 mins.

Linimentum Calcis, 1 in 800. (Carron oil.)

(Equal parts of solution of lime and olive oil.)

Vienna paste. See p. 23.

Pharmacology and Therapeutics.

ANTACID, ASTRINGENT, SEDATIVE.

Liquor Calcis is very little used as an antacid in the mouth. It is added to milk to render the curd finer and more digestible. *Liquor Calcis Saccharatus* is an antidote for poisoning by carbolic acid.

LOCAL ANÆSTHETICS, LOCAL ANODYNES, OBTUNDENTS.

Local Anæsthetics (*ἀν* without, *αἰσθησις* perception).

Reduce or destroy temporarily the sensibility of a part by interference with the functions of the peripheral extremities or trunks of sensory nerves.

Example.—Cocaine applied to gum to render it insensitive while fitting a collar to a root.

Local Anodynes (*ἀν* without, *ὀδύνη* pain).

Means employed locally for relief of pain.

Example.—Morphine added to pastes used for devitalising the pulp.

Obtundents (*Obtundo*, I make blunt or dull).

Agents used to deaden pain ; in dental practice the term is usually employed to denote means for reducing the sensibility of dentine.

Example.—Nitrate of silver applied to carious dentine before excavation.

These agents include :—

1. Cold.

Prolonged or extreme cold causes first numbness and then complete local anæsthesia, by reducing the function of sensory nerves.

Example.—Cold produced by chloride of ethyl or ether spray to freeze the gum before extraction of stumps or teeth.

Moderate cold may have a distinct, but temporary, anodyne action by reducing the excessive blood supply.

Example.—A patient holding cold water in the mouth to relieve aching of an actively congested pulp.

2. Heat.

Extreme heat destroys the irritability of protoplasm, but is not often employed as an obtundent.

Moderate heat acts as an anodyne in inflammatory disturbance by dilating and relieving the blood-vessels, and increasing osmosis and migration of cells.

Example.—Fomentations in periodontitis.

3. Drugs.

- (i.) May act by directly depressing the nerve fibrils.
- (ii.) Through the blood-vessels. See Cold and Heat.
- (iii.) By destruction of protoplasm.

Some drugs which destroy living protoplasm (caustics) may act as local anæsthetics by destroying entirely the nerves or fibrils of the part. On this account, therefore, care must be used in their application to other purposes, as extensive damage to tissue may ensue before the patient is aware of it.

Example.—Skin of face burnt by the running down of carbolic acid or chloroform.

Caustic drugs are, however, frequently of much service for their obtundent action.

Example.—Silver nitrate.

As regards sensitive dentine, it should always be remembered that the skilful use of sharp instruments is the *sine quâ non* of causing patients the minimum of pain.

Rest, secured by the use of protective dressings, is a valuable obtundent.

Drugs may be applied by painting or rubbing in, by hypodermic injection, under pressure, or by electrophoresis.

HYPODERMIC INJECTION. In administering drugs by this method, the chief points to be considered by the dental surgeon are :—

1. Absolute **sterilisation** of the syringe and solutions, and as far as possible that of the tissues also, followed by the maintenance of an antiseptic condition of the mouth for a few days afterwards.

2. The **distension** (as shown by blanching) of the tissues to be anæsthetised.

This requires a well-made syringe and the use of considerable force on the piston.

3. The avoidance of **veins** (shown by the sudden easy injection of the solution, and possibly by sudden faintness of the patient).

4. The avoidance of **damaging** the tissues unnecessarily with needle, or passing it through or into any septic focus, such as the pocket of gum at the neck of a tooth.

In selecting a local anæsthetic for tooth extraction one is guided mainly by the possibility of thorough application, and the tolerance of the patient to the preliminary steps ; also by the risk of subsequent septic inflammation.

In the choice of obtundents for sensitive dentine we have to consider the

1. Cause of the sensitiveness.
2. Depth of penetration and efficacy of the drug.
3. Rapidity of action.
4. Initial pain.
5. Staining effect.

PRESSURE. Solutions of drugs may be forced right through the live and sound dentine and thus applied to the pulp by means of very powerful special syringes, but a small cavity must be made to fit the

syringe nozzle. Apart from the difficulty of applying the syringe effectively, and the complex instrument required, the pulp may be seriously damaged by fluid thus forced in.

A much more useful method is the application of cocaine to an exposed pulp by gentle pressure with a pad of rubber.

Before using this method the cavity should be cleansed of *débris* and caries as far as possible, then a small, easily soluble billet of $1\frac{1}{2}$ gr. of cocaine and quinine placed on the moistened exposure, a pad of warm, unvulcanised rubber large enough to fill the floor of the cavity placed over it, and gentle, steady pressure slowly applied. As soon as the tenderness ceases, the pressure should be increased.

By this means, in a large number of cases, complete anæsthesia of the pulp may be obtained in half a minute, the patient usually expressing a sense of security from, and total cessation of, pain. In other cases no anæsthesia results, and if the operation has been correctly performed in the first instance, a second attempt, or prolonged pressure, is seldom successful. The authors are unable to explain all the reasons for failure, but believe that the presence of a large amount of dead pulp between the cocaine and the tender portion is a common one.

ELECTROPHORESIS.

Ionic Medication, Ionto-phoresis, or Electrophoresis (Anaphoresis or Cataphoresis) denote the method of introducing drugs or chemical substances into the tissues of the body through the agency of a continuous electric current.

Ions are electrically charged atoms.

The passage of an electric current through any fluid which conducts electricity (called an electrolyte) is attended with a certain movement of the atoms contained in the solution, and which are the carriers of the current. Pure water, glycerine, oils and alcohol are not electrolytic, and do not conduct

electricity until after the introduction of (possibly minute) quantities of soluble salts or acids.

It is considered that every composite molecule consists of two parts, having electric charges of opposite polarity, which cause them to attract one another, forming an electrically neutral mass. At the moment the molecule splits into atoms these electric charges reappear in the atoms, positive or negative as the case may be.

In electrolytes are found neutral molecules, free positive and free negative ions, which are atoms dissociated by the action of the current on the molecules. If two wires or other terminals (electrodes) from an electric cell or battery are placed a short distance apart in a solution of a salt (such as NaCl), the result of passage of current will be that the cations, or positively charged metallic radicles, will move towards the cathode, or negative pole, while the anions, or negatively charged acid radicles, move towards the anode, or positive pole.

All the metallic radicles, such as zinc, copper, silver, etc., the hydrogen ions of acids, and ions of alkaloids are charged with positive electricity, while acid radicles—chlorine, salicylic acid, iodine, etc.—and hydroxyl ions of alkaloids are negatively charged.

The human body is an electrolyte by means of the saline solutions present in it. Dry tissues, such as dry skin, dry dentine, hair and nails, do not conduct electricity, but moist skin, dentine, etc., by virtue of the fluids contained in the pores and tubules, may be made to conduct electric currents. By soaking some absorbent material with solutions of various chemical substances, pressing firmly against the part it is desired to treat, and passing a current through the electrolyte (which in this instance is the body plus the soaked pad), drugs from the latter may be made to pass right into the tissues, penetrating into the protoplasm of the cells to a depth of 2 or 3 cm., beyond which point they are usually carried away by the blood stream. It must, of course, be borne in mind

whether the ions it is desired to liberate are anions or cations, and the direction of the current arranged accordingly.

This is the theory of ionic medication, which has been employed in dentistry for introducing disinfectant drugs to sterilise root-canals, exercise antiseptic influences upon chronic abscesses, disinfect pyorrhœa pockets, introduce local anæsthetics into hard and soft tissues, bleach teeth, mummify the remains of pulp in roots, and remove epulides.

The apparatus required for ionic medication consists of :—

(1) Solutions of drugs that it is desired to employ, generally in a strength of 2 or 3 per cent.

(2) Suitable electrodes.

The indifferent electrode, which is grasped in the patient's hand, or strapped on to the arm or wrist, should be fairly large. The active electrode, by means of which the drugs are introduced, must of necessity be shaped according to the situation it is desired to reach, bearing in mind that the larger the electrode that can be used the less resistance will the tissues offer to the passage of current.

Fine wires are best avoided for this reason.

Electrodes of platinum are often used, but for such purposes as sterilising pyorrhœa pockets broad spear-shaped needles of zinc or copper are better employed, these being isolated from the tissues by the interposition of cotton-wool or thread soaked in the chemical it is desired to convey. If dry electrodes be used in direct contact with the tissues a caustic effect is liable to be produced by the liberation of acids.

(3) A suitable means for producing current.

This is usually a battery of Leclanché cells 18 to 32 in number, giving a maximum of 48 volts, fitted with a sliding wire resistance, and an ammeter, or apparatus for measuring current-strength in milliampères.

Switchboards to utilise current from the main supply are best not used, as without great care "earth" shocks may occur.

It is of great importance that the current should be introduced and turned off *gradually*, partly to avoid pain to the patient, and partly because by this means a stronger current can be tolerated. The electrode, once placed *in situ*, must not be moved so as to break contact until the current is reduced to zero.

A current of as much as 5 milliampères may be tolerated, or as little as 2. In the former case two minutes' application will be sufficient, in the latter about five minutes will be required; as the number of ions that can be made to pass depends entirely upon the strength of the current and the time, and not at all upon the degree of concentration of the drug employed.

Cocainæ Hydrochloridum. HYDROCHLORIDE OF COCAINE.

Materia Medica.

Source. The hydrochloride of an alkaloid obtained from *Erythroxylum coca*.

Dose. $\frac{1}{5}$ to $\frac{1}{2}$ gr.

Incompatibles. Borax, perchloride of mercury, alkalies, alkaline carbonate, carbolic acid, soluble silver salts, cresylic acid (lysol, etc.).

Characters. Colourless acicular crystals or a crystalline powder.

Solubility. 2 in 1 of cold water,
1 ,, 4 ,, alcohol.

Note. Aqueous solutions of cocaine quickly decompose.

Preparation. *Injectio Cocainæ Hypodermica* (B.P.). 1 in 10.

Cocaine hydrochloride, 33 grs.; Salicylic acid, $\frac{1}{2}$ gr.;
water, 6 drs. Dose. 2 to 5 mins.

Pharmacology.

LOCAL ANÆSTHETIC, OBTUNDENT, ANODYNE, NERVINE STIMULANT.

LOCAL ANÆSTHETIC. Cocaine is a powerful poison to all forms of protoplasm, and acts by paralyzing the nerve terminations. It will also paralyse the nerve trunks if injected into them, but this practice is not recommended.

Therapeutics.

LOCAL ANÆSTHETIC. An interval of from 5 to 10 minutes is required before the full anæsthetic effect of cocaine is produced. The anæsthesia passes off in half an hour.

A 10% solution or the raw crystals may be applied to the gum for the removal of polypi or roots or for fitting a collar.

Cocaine has been used in dentistry in the form of the hypodermic injection before extraction of teeth; but it is better **never** to employ it in this form, but to use novocain instead, for the following reasons:—

(i.) Cocaine is 3 or 4 times as poisonous.

(ii.) Cocaine solution quickly decomposes and is difficult to keep free from fungi, whereas those of the synthetic products keep well, and may be boiled (and consequently sterilised) each time before use, without fear of decomposing the drug.

(iii.) Cocaine when injected has an irritant and destructive action on all the tissues with which it comes in contact, causing swelling and sometimes necrosis of the injected area. Novocain is free from this objection.

When the tooth pulp is exposed, or even almost exposed, the drug may in most cases be made to penetrate the pulp and render it completely insensitive by placing $\frac{1}{16}$ or $\frac{1}{8}$ gr. of cocaine in the cavity, moistening it, and gradually pressing on it with a plug of soft rubber.

A solution of cocaine (4%), applied in the form of a spray to the palate and fauces, is sometimes useful in checking retching during the taking of an impression. Care should be taken not to use more than one drachm of the solution.

ANODYNE. Sometimes useful to relieve pain of acute periodontitis, painted on the gum outside roots. Acts by contracting vessels and diminishing supply of blood to the part.

OBTUNDENT to sensitive dentine used with electro-phoresis, or simple pressure. (Useless if simply painted on.)

Toxicology.

Is a drug to be employed with caution, as alarming symptoms may follow an overdose. In no case should more than $\frac{3}{4}$ gr. be injected at once.

9 grs. swallowed and 20 mins. of *injection* are recorded as having caused poisoning.

Symptoms of poisoning.

Fainting, possibly convulsions ; delirium.
Acceleration and weakening of pulse ; dyspnoea.
Dilatation of pupils.

Treatment.

Stimulants. Ammonia.
Amyl nitrite inhalation.
Warmth ; recumbent posture ; artificial respiration.

Novocain. (Non-official.) PARA-AMIDO-BENZOYL-DIETHYL-AMINO-ETHENOL HYDROCHLORIDE.
 $C_6H_4, NH_2, COO, C_2H_4, N(C_2H_5)_2, HCl.$

Materia Medica.

Characters.

A white crystalline powder.

Cocaine Substitutes for Injection.

		Solutions fairly permanent.	Solutions may be boiled.	Compatible with Adrenalin.	(Compared with Cocaine.) Efficiency. Toxicity. Irritant action.
Novocain	.	insufficiently soluble to form 2% solution. { 2% in warm H ₂ O sufficiently soluble to form 2% solution in cold water.			equal
Stovaine	.				greater
Beta-eucaine lactate	.				equal
Alypin	.				equal
Tropacocaine	.				equal
Nirvanin	.				less
Beta-eucaine	.				
Holocaine hydrochloride	.				
Acoïne	.				
Orthoform (new)	.				
Anæsthesine	.				

From B.M.J., 1909, p. 783.

Solubility.

Readily in cold water.

Dose. $\frac{1}{2}$ to 1 gr.

Pharmacology.

LOCAL ANÆSTHETIC. Action similar to cocaine, but more rapid and less lasting, much less toxic, and does not irritate the tissues. May be boiled without decomposing. Hence to be preferred for injection into the gum.

Therapeutics.

A 2% solution, or a 2% solution containing also suprarenin borate and sodium chloride, is most suitable for injecting to prevent the pain during the extraction of teeth. 20 mins. is usually ample for one tooth.

Aconitum. ACONITE.**Materia Medica.**

Synonym. Monk's-hood.

Source. Root of *Aconitum napellus*.

Preparations.

Tinctura Aconiti, 1 in 20. *Dose.* 2 to 15 mins.

Fleming's Tincture of Aconite, 1 in $1\frac{1}{2}$.

(Non-official.)

Dose. $\frac{1}{8}$ to 1 min.

The latter preparation (about twelve times the strength of the former) is sometimes ordered for external application, but is of a dangerous strength to use in the mouth without caution.

Pharmacology.

LOCAL ANÆSTHETIC, ANODYNE, FEBRIFUGE.

LOCAL ANÆSTHETIC, ANODYNE. Applied locally aconite paralyses the terminations of the sensory nerves, causing first a sensation of tingling, then numbness.

FEBRIFUGE. Administered internally in frequent small doses, aconite reduces force and frequency of pulse, flushes skin, and lowers temperature. Used in general therapeutics to control fever and pain.

Therapeutics.

Used in dentistry in conjunction with iodine when the counter-irritant properties of the latter are desired, to relieve the pain caused. It appears also to have a distinct effect in controlling local inflammatory action.

Toxicology.

On account of its depressing action on the heart, aconite is a powerful poison.

25 mins. of *Fleming's tincture* have killed a man.

Symptoms of poisoning.

Tingling and burning of lips, mouth and throat.

Epigastric pain, nausea, vomiting.

Irregular feeble pulse ; dyspnoea.

Dilated pupils.

Treatment.

Wash out stomach.

Warmth, stimulants, artificial respiration.

Hypodermic injection of 20 mins. of *Tr. Digitalis*.

Belladonna. BELLADONNA.

Materia Medica.

Source. The leaves and root of *Atropa belladonna*, or deadly nightshade.

Preparations.

From leaves, *Extractum Belladonnae viride*.

From roots, *Extractum Belladonnae Liquidum*.

Linimentum Belladonnae.

Atropinae Sulphas. SULPHATE OF ATROPINE.

An alkaloid obtained from the belladonna plant.

Dose. $\frac{1}{200}$ to $\frac{1}{100}$ gr. $\frac{1}{120}$ gr

Characters. Colourless acicular crystals.

Solubility.

1 in 1 of water,

1 „ 10 of alcohol.

Insoluble in ether and chloroform.

Pharmacology.

ANODYNE AND LOCAL ANÆSTHETIC. Diminishes all secretions (thus, ANTISIALAGOGUE), quickens pulse by paralyzing vagus nerve endings in heart; first raises, then lowers, blood-pressure; DILATES PUPIL.

ANODYNE. Belladonna depresses the sensory nerve endings, and when applied locally to an inflamed part the anodyne effect is aided by a relaxation of the blood-vessels after preliminary contraction.

Therapeutics.

The *extract* or *green extract* is of use in the treatment of inflamed glands, and seems to have a considerable effect in reducing the inflammation and even preventing suppuration, while relieving the pain. These preparations should be prescribed 1 part to 2 of glycerine (as the latter substance causes the Belladonna to be absorbed), to be painted on the affected part and covered with flannel or spongiopiline. *Liniment of Belladonna* may be employed locally in neuralgic affections, alone, or in combination with aconite. *Atropine* is sometimes added to devitalising powders instead of morphine.

ANTISIALAGOGUE. See p. 121.

Toxicology. $\frac{1}{2}$ gr. of atropine has killed a man.

Symptoms of poisoning.

Dry throat, thirst, difficulty in swallowing.

Vomiting.

Widely dilated pupils.

Small rapid pulse, flushing, a rash.

Delirium, coma.

Treatment.

Wash out stomach.

Give $\frac{1}{4}$ gr. of *pilocarpin*.

Brandy, strong coffee, artificial respiration.

Opium and its preparations. **Morphine.**

See p. 191.

Materia Medica.

Preparations.

Morphinae Acetas.

A white powder, soluble 1 in $2\frac{1}{2}$ of water, and
1 in 100 of alcohol. Dose. $\frac{1}{8}$ to $\frac{1}{2}$ gr.

Morphinae Hydrochloridum.

A white crystalline powder, soluble 1 in 24 of
water, and 1 in 50 of alcohol.

Dose. $\frac{1}{8}$ to $\frac{1}{2}$ gr.

***Tinctura Opii* (Laudanum).**

Contains 0·75 gramme of Morphine in 100 cc.

Dose. 5 to 15 mins.

Pharmacology and Therapeutics.

In contrast with the powerfully GENERAL SEDATIVE action of these drugs their local sedative action is small. They, however, possibly possess some local ANODYNE action.

Morphine is added to arsenical devitalising pastes and "fibre" with the object of lessening the pain caused.

Tincture of Opium (laudanum) on cotton-wool in a carious cavity will sometimes relieve odontalgia, though this may be rather the result of the alcohol contained in the preparation.

A fomentation made by breaking up six *poppy capsules* in a quart of water, then boiling down to a pint, may relieve pain after tooth extraction, used frequently hot in the mouth, the patient being told not to swallow any. Here, again, it is the heat probably that has the anodyne action rather than any small quantity of opium contained in the solution.

Oleum Caryophylli. OIL OF CLOVES.

and

Oleum Cinnamomi. OIL OF CINNAMON.

Materia Medica. Dose. $\frac{1}{2}$ to 3 mins.

Source. The oils distilled from cloves and cinnamon bark respectively.

Soluble in spirit or ether.

Incompatibles. Clove oil is incompatible with lime water, salts of iron, mineral acids, gelatine.

Pharmacology.

Typical members of an important pharmacological group known as "aromatic volatile oils."

LOCAL ANÆSTHETIC, ANODYNE, ANTISEPTIC, STIMULANT, SIALAGOGUE, FLAVOURING AGENT.

LOCAL ANÆSTHETIC. Action incomplete, and of little practical use.

Primarily powerfully STIMULANT, the anæsthetic effect is brought about by over-stimulation and consequent exhaustion for the time being of the ends of the sensory nerves.

ANODYNE. Partly from their sedative action on the nerves, and partly from their action in dilating the blood-vessels, these oils tend to cause resolution of inflammation when applied locally.

Therapeutics.

ANODYNE. From the actions mentioned above, clove and cinnamon oils are often of service in relieving the pain of an exposed, inflamed, or irritable tooth pulp when applied to the cavity.

ANTISEPTIC. See p. 92.

STIMULANT AND SIALAGOGUE. See p. 121.

AS FLAVOURING AGENTS. See p. 126.

Eugenol or Eugenic Acid.

The active principle of clove and cinnamon oils.

Action and uses : Similar to these ; by some considered more efficacious.

Camphora. CAMPHOR.

Materia Medica.

Dose. 2 to 5 grs.

Source. A stearoptene obtained from the wood of *Cinnamomum camphora*.

Characters. Tough, solid, transparent, colourless masses, with characteristic odour.

Solubility.

Readily in alcohol, chloroform, or ether.

1 in 700 of water,

1 „ 2 „ oil of turpentine,

1 „ 4 „ olive oil.

Preparation.

Spiritus Camphoræ. 1 in 10 rect. spirit.

Dose. 5 to 20 mins.

Pharmacology and Therapeutics.

Camphor rapidly penetrates the skin and irritates the tissues, causing a burning sensation and dilatation of the vessels. This is soon followed by a sedative action on the nerve terminations.

LOCAL ANÆSTHETIC. *Spiritus Camphorae* mixed with equal parts of ether and chloroform, and applied to the gum before tooth extraction. Its efficacy is not very great.

ANODYNE. Camphor is often combined with other drugs as a liniment in neuralgia.

R.

Chloral Hydras

Menthol

Thymol āā. ʒ j.

Camphor ʒ iij.

Tere et misce. Fiat linimentum.

Signa. Paint on the affected part with a brush.

OBTUNDENT. The *spirit* is used to relieve the pain of sensitive dentine ; and from its sedative action allays retching during the taking of an impression of the mouth, if previously the fumes be inhaled for a few minutes.

ANTISEPTIC. Camphor has a weak antiseptic action.

Menthol. MENTHOL.**Materia Medica.**

Synonym. Peppermint camphor.

Source. A stearoptene obtained from *Mentha arvensis* and *Mentha piperita*.

Dose. $\frac{1}{2}$ to 2 grs.

Solubility.

Sparingly in water.

Freely in spirit.

Pharmacology and Therapeutics.

Closely resembles camphor (see above). The ANODYNE action is more marked, and this drug is frequently employed as a local anti-neuralgic, in the form of sticks or pencils to be rubbed on the painful part, or as a liniment, such as that given under camphor.

Thymol. THYMOL. ISO-PROPYL-META-CRESOL.**Materia Medica.**

Source. A stearoptene obtained from the volatile oils of *Thymus vulgaris*.

Characters. Large crystals having the odour of thyme and a pungent aromatic taste. Volatilises at a temperature below 100° C.

Dose. $\frac{1}{2}$ to 2 grs.

Solubility.

⇒ Sparingly in water.

Freely in alcohol and ether.

Pharmacology and Therapeutics.

ANTISEPTIC, ANÆSTHETIC.

ANÆSTHETIC. Thymol has an action similar to menthol, but is slightly more irritant.

ANTISEPTIC. See p. 88.

Alcohol Ethylicum. ETHYLIC ALCOHOL. See p. 160.**Pharmacology and Therapeutics.**

ANODYNE. When diluted and used as a lotion is a refrigerant. See Anodyne action of cold.

In the form of *brandy* or *whisky* held in the mouth it is a popular remedy for an aching tooth; its efficacy in this respect may partly depend on its astringent properties.

OBTUNDENT. Relieves pain of sensitive dentine by coagulating contents of dentinal tubules, which it may be made to penetrate by first drying out the cavity thoroughly with amadou and hot-air syringe.

Carbolic Acid. See p. 84.**Pharmacology and Therapeutics.**

LOCAL ANÆSTHETIC. Carbolic acid has in addition to its other actions that of a local anæsthetic, in part due to its properties as a caustic, but also to a distinct sedative effect upon sensory nerve endings. It is employed for this purpose in cutting away quite small polypi of the gum or pulp, in the form of *Acidum Carbolicum Liquefactum* painted on the part; for larger operations of the kind it is useless, as it does not penetrate deeply.

LOCAL ANODYNE. Strong carbolic acid applied on wool to a carious cavity is one of the most powerful remedies we possess for odontalgia due to an exposed or inflamed pulp, often relieving the pain instantly. It forms the chief ingredient in many quack "toothache cures." In the strength of **1 in 10**, or **1 in 20**, applied on a pledget of wool to the socket of an extracted tooth it relieves the subsequent aching.

OBTUNDENT. Strong carbolic, dried in with hot air, is a useful remedy for over-sensitive dentine, and acts by coagulating the contents of the dentinal tubules.

A solution of carbolic, **1 in 40**, may be used to gargle the mouth with before taking impressions, and from its sedative action is useful in preventing retching.

Acidum Arseniosum, Argenti Nitras, Zinci Chloridum, Formic Aldehyde, Paraform.

All act as **OBTUNDENTS** to sensitive dentine by means of their **CAUSTIC** action. See pp. 17, 19, 20, 81.

Æthyl Chloridum. ETHYL CHLORIDE. C_2H_5Cl .
Not official.

Materia Medica.

Synonym. Hydrochloric ether.

Character. A colourless liquid (gaseous at ordinary temperatures) with a low boiling point, about $50^{\circ} F$.

Pharmacology and Therapeutics.

LOCAL ANÆSTHETIC (refrigerant), GENERAL ANÆSTHETIC.

LOCAL ANÆSTHETIC. On account of the intense cold produced by its evaporation it is used for operations, such as extraction of stumps or cutting away small portions of polypi of the gum. (See Cold.) To "freeze" the part satisfactorily it must be dried, and the chloride (which is volatilised by the warmth of the hand) directed from the nozzle of the capsule in which it is usually supplied, at a distance of six to ten inches, till the gum becomes white; then perform the operation quickly.

It follows from what has been said that ethyl chloride is of less value for local anæsthetic purposes at the back of the mouth, where it is difficult to apply, or where there is a copious flow of saliva.

Note.—It is not safe to employ intense cold for anæsthetic purposes in the case of aged persons, or those with a defective circulation, as **gangrene** of the part (practically "frost-bite") has been known to result, causing ultimate death of the patient.

Neither should it be employed for the extraction of very septic roots with much inflammation, as the lowering of the vitality of the part which results may cause increased activity subsequently on the part of the micro-organisms, and extensive sloughing be the result.

The vapour of ethyl chloride is **inflammable**, and must not be employed near a lighted lamp or other flame.

Patients should be warned not to close the mouth during the application, as the bubbling, if they do so, is alarming, especially to children.

Even during its local application general anæsthesia, with its attendant dangers, may be produced if the patient inhales by the mouth.

GENERAL ANÆSTHESIA. See p. 195.

ETHYL-CHLORIDE is also known under the trade name of Kelene, and a more volatile mixture of methyl- and ethyl-chloride as Anæstile, Anæsthyll and Coryl, also a mixture of ethyl-bromide, methyl- and ethyl-chloride as Soemnoform.

SIALAGOGUES, ANTI - SIALAGOGUES, AND DEMULCENTS.

Pickerill has shown that not only the amount, but also the composition of the saliva is affected by these substances, and in a very definite way, and that the effect may endure for a considerable time afterwards. Thus the quantity, alkalinity and ptyalin are all markedly increased by acid flavours, and to a less extent by sweet substances, and that they are reduced by alkalies, chalk, tannin and sapid substances, and "that the saliva is completely under control ; that it may be altered or varied in amount or composition ; that its beneficial effects may be increased or decreased absolutely at will."

Sialagogue (σίαλον, saliva, ἄγω, I lead). That which causes a flow of saliva.

Anti-sialagogue. That which diminishes or arrests the flow of saliva.

Demulcent (*demulcere*, to soothe). A substitute for the natural secretions of the mouth.

A normal healthy secretion of saliva is essential to the hygiene of the mouth and the preservation of the teeth, and when prescribing mouth-washes this should not be forgotten.

The quantity and quality of the saliva is a matter so correlated with the general health of the patient that we consider it unwise for a dentist to prescribe remedies, beyond simple local applications, for its regulation, unless he is fully cognisant of all the circumstances, and is competent to deal with general diseases.

On the other hand, it is necessary for the dentist to be acquainted with the effects of drugs on the secretion of the mouth.

The flow of saliva is :—

1. **Increased** by aromatic oils, bitters, aromatic bitters, spirits, chloroform, pungent bodies, sweet substances, acid or sour substances, and also such drugs as jaborandi, tobacco, mercury, iodine, antimony, and ipecacuanha.

2. **Diminished** by insipid or nauseous bodies, dilute alkaline or soapy substances, and by belladonna (atropine), tobacco (in excess), and opium. And also by depressing nervous influences.

Apart from the secretions of the mouth there are its **excretions**, which, in disease, may give rise to bad odour. *Mercury* and *iodine* are excreted from the mucous membrane, and may cause trouble.

Potassii Tartaras Acida. ACID TARTARATE OF POTASSIUM. $\text{KHC}_4\text{H}_4\text{O}_6$.

Materia Medica.

Synonym. Cream of tartar.

Source. Prepared from argol, deposited in wine casks.

Dose. 20 to 60 grs. as a diuretic.

2 to 8 drs. as a purgative.

Solubility. 1 in 180 of cold water.

Characters. A white gritty powder, with pleasant acid taste.

Pharmacology.

SIALAGOGUE, DIURETIC, PURGATIVE.

SIALAGOGUE. Tartaric acid and other ORGANIC ACIDS such as occur in fruits are the most powerful natural sialagogues, increasing the amount of the saliva and also very markedly its alkaline index and

the amount of ptyalin, the action continuing for a considerable time.

Therapeutics.

It has been suggested as an ingredient of an acid mouth-wash.

<i>Potassii Tartarati Acidi</i>	gr. ii.
<i>Acidi Tartarici</i>	gr. i.
<i>Olei Limonis</i>	℥. iii.
<i>Glusidi</i>	gr. $\frac{1}{2}$.
<i>Aquam</i>	ad $\frac{3}{4}$ j.

Misc. Fiat collutorium.

Signa. The mouth-wash.

Myrrha. MYRRHA. See p. 41.

Pyrethri Radix. PELLITORY ROOT.

Materia Medica.

Source. The dried root of *Anacyclus pyrethrum*.

Preparations.

Tinctura Pyrethri, 1 in 5. Dose. $\frac{1}{2}$ to 1 dr.

Pharmacology and Therapeutics.

Pellitory causes a sharp, burning sensation in the mouth, followed by tingling and numbness and a profuse flow of saliva. (See p. 42.) It is useful as a stimulating application to passively congested gums and to give a "clean" taste to dentifrices. (3 ss. to $\frac{3}{4}$ i.) As a stimulant aseptic mouth-wash the following is useful :—

R.

<i>Tincturae Pyrethri</i>	$\frac{3}{4}$ j.
<i>Tincturae Tolutani</i>	$\frac{3}{4}$ ss.
<i>Aquam Destillatam</i>	ad $\frac{3}{4}$ iv.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

Add sufficient to water to give a sharp taste.

Aromatic Oils. See p. 112.

The aromatic oils have a stimulating action on the mucous membrane and especially on the nerves of taste, and cause a reflex stimulation of the salivary and mucous glands and a natural flow of saliva and mucus.

Belladonna. See p. 109.**Sulphate of Atropine.** See p. 110.**Pharmacology.**

Belladonna or atropine administered internally will arrest the flow of saliva and cause dryness of the mouth ; but inasmuch as they also arrest other secretions, and are powerful poisons, their use for such purposes is inadvisable.

Therapeutics.

$\frac{1}{100}$ gr. of *atropine sulphate*, dissolved in a few drops of water and applied to the gum by means of a wad of blotting paper, will locally arrest the secretions from that portion of the gum in a little while, and is sometimes of use when inserting cement fillings without the use of the rubber dam.

Opium. See pp. 111 and 191.**Pharmacology.**

Opium or morphia taken internally **ARRESTS THE SECRETION** of saliva by its specific action. It is also readily absorbed by the mucous membrane of the mouth, and exerts a marked local action, so that the mouth becomes dry, the tongue foul, and there is a thickness of voice and thirst.

Glycerinum. GLYCERINE. $C_3H_5(OH)_3$.

Dose. 1 to 2 drs.

Preparations.

Glycerinum Acidi Carbolici.

„ „ *Tannici.*

„ *Boracis.*

Glyceritum Boroglycerini. (U.S.P.)

Solubility.

Freely in water or alcohol.

Insoluble in ether, chloroform, or oils.

Pharmacology.

Glycerine is slightly STIMULANT, ANTISEPTIC, and HYGROSCOPIC, and imparts a smooth, SWEET TASTE to astringent mixtures. It is readily absorbed by the unbroken skin, and will carry in with it substances dissolved.

Therapeutics.

Acts as a DEMULCENT when diluted with water, 1 in 3. It is the antidote to the local caustic action of carbolic acid by dissolving out and diluting it.

Tragacantha.

Materia Medica.

Source. A gummy exudation collected from *Astragalus gummifer*.

Characters. White or yellowish, inodorous, nearly tasteless flakes.

Composition. Tragacanth consists of two gums :

Bassorin (33%), comparatively insoluble in water and unfermentable, and a gum nearly identical with the **arabin** of acacia (53%).

Solubility. Very sparingly soluble in cold water.

Preparations.

Glycerinum Tragacanthae.

Tragacanth, 3; Glycerine, 12; Water, 2.

Mucilago Tragacanthae, 1 in 80 of water
(with the aid of rectified spirit).

Pharmacology and Therapeutics.

Gum tragacanth, when moistened, swells up into a glutinous mass, which is only slightly soluble, and so forms a non-irritant, PROTECTIVE COATING, which is very useful and comforting in raw conditions of the mucous membranes.

Example.—Red glazed tongue.

R.

<i>Tragacanthae</i>	$\bar{\zeta}$ j.
<i>Olei Amygdalae</i>	m. x.
<i>Aquam</i>	ad $\bar{\zeta}$ ij.

Misce. Fiat mistura.

Signa. The application.

A teaspoonful to be spread over the gums and tongue.

Note.—*Mercury* and *iodine* are excreted by the mucous membrane of the mouth, and are apt to set up irritation and inflammation. Should particularly septic conditions be present, as around collections of tartar on the lower incisors, this inflammation will probably run on to ulceration and necrosis. Hence it is very important that the mouths of patients taking these drugs should be kept scrupulously clean, in which case little harm is likely to happen.

COLOURING, PERFUMING, AND FLAVOURING DRUGS.

The rendering of prescriptions as pleasant as possible to sight, smell and taste is a minor but important part of the art of prescribing (see p. 118).

Patients are more apt to use a remedy, and more regularly, if it is made agreeable.

After operations about the mouth, especially sealing, some pleasant and refreshing lotion is very grateful to the patient.

Demuleents should not be used to hide the taste of antiseptics, as they also hinder the action of the latter. It is also undesirable to employ acidly fermentable bodies in the mouth.

The age and tastes of patients should be considered—*e.g.*, sweet flavours are more suitable for children and women, and aromatic preparations for men.

The other ingredients of a mixture must also be considered both as to flavour, etc., and also as to miscibility.

Colouring.

For colouring watery or alcoholic liquids.

Tr. Persionis (non-official). $12\frac{1}{2}\%$ in alcohol (30%).
Use 2 m. to 1 $\bar{\text{z}}$.

Tr. Krameriae. See p. 46. Use 10 m. to 1 $\bar{\text{z}}$.

Both give a red colour and are miscible with alcohol and water. The *Tr. Krameriae* has an astringent flavour.

Tr. Croci (non-official). 10% in alcohol (50%).
Use 2 m. to 1 ̄.

Prepared from dried stigmata and tops of the styles of *Crocus sativus*. Gives a yellow colour and contains a volatile oil. It has a strong aromatic odour and bitter aromatic taste.

For powders.

Carmines (non-official).

A precipitate from decoction of *cochineal* (official) by alum, soluble in alkalies and alcohol; gives a red colour.

For imparting a sweet taste.

Glycerinum (see p. 122) may be employed as the solvent for such drugs as boracic acid, tannin, etc., though it is not strong enough to counteract the drawing sensation of the last-mentioned drug.

Glusidum (saccharin) may be added to mixtures or dentifrices. It is only slightly soluble in water, (1 in 410), but much more soluble in alcohol (1 in 30), glycerine (1 in 50), and dilute alkalies. May be employed in the strength of $\frac{1}{2}$ –1 gr. to ̄ iv.

Syrupus (sugar) and *Mel* (honey) are open to the objection that they are acidly fermentable.

For imparting a sweet odorous flavour.

Oleum Rosae. Use 1 m. to 1 ̄.

Aqua Rosae. Ad libitum.

Oleum Rosmarini. Use 1 m. to 1 ̄.

Oleum Lavandulae Florum. Use 1 m. to 1 ̄.

Spiritus „ „ Use 16 m. to 1 ̄.

Oleum Amygdalae Essent. Use 1 m. to 1 ̄.

Aqua Sambuci (*Elder-flowerwater*). Ad libitum.

Syr. Aurantii. Use 10 m. to 1 ̄.

Pulv. Iridis Rhizome (*Orris root*). Use ̄ ss to 1 ̄.

As aromatic flavours,

Aqua Aurantii Florum. Use ad libitum.

Oleum Limonis. Use 1 ℥. to 1 ℥.

Oleum Bergamotae. „

Menthol. Use 1 gr. to 1 ℥.

Ol. Gaultheriae (Oil of winter green). Use
1 ℥. to 1 ℥.

Syr. Zingiberis and Tr. Zingiberis. Use 10 ℥.
to 1 ℥.

Ol. Myristicae (Oil of nutmeg). Use 1 ℥. to 1 ℥.

Sp. Myristicae. Use 10 ℥. to 1 ℥.

Oleum Carui. Use 1 ℥. to 1 ℥.

Ol. Caryophylli (Oil of cloves). Use 1 ℥. to 1 ℥.

Oleum Cinnamomi. Use 1 ℥. to 1 ℥.

Aqua „ Use ad libitum.

Spiritus „ Use 10 ℥. to 1 ℥.

Oleum Coriandri. Use 1 ℥. to 1 ℥.

*Aqua Menthae Piperitae (Peppermint
water).* Use ad libitum.

Oleum Menthae Piperitae. Use 1 ℥. to 1 ℥.

Sp. Menthae Piperitae. Use 10 ℥. to 1 ℥.

Alcohol imparts a warm taste.

Aqua Chloroformi. Use ad libitum.

Sp. „ Use 10 ℥. to 1 ℥.

Tr. Myrrhae. Use 20 ℥. to 1 ℥.

Balsamum Tolutanum.

Tinctura Tolutani. Use 10 ℥. to 1 ℥.

Syrupus Tolutani. Use 1 ℥ to 1 ℥.

Tr. Calendulae (Marigold). Use 1 ℥ to 1 ℥.

Pyrethri Radix (Pellitory root). Use 3 ss to 1 ℥.

—are available.

As perfumes,

<i>Aqua Rosae.</i>	Use ad libitum.
<i>Oleum Rosae.</i>	Use 1 m. to 1 ℥.
<i>Oleum Rosmarini.</i>	„
<i>Oleum Eucalypti.</i>	„
<i>Eau de Cologne.</i>	Use 10 m. to 1 ℥.
<i>Aqua Sambuci (Elder-flower).</i>	Use ad libitum.
<i>Aqua Lavandulae Florum (Lavender Water).</i>	Use ad libitum.
<i>Oleum Lavandulae Florum.</i>	Use 1 m. to 1 ℥.
<i>Sp.</i>	„ „ Use 10 m. to 1 ℥.
<i>Tr.</i>	„ <i>Composita.</i> Use 10 m. to 1 ℥.
—are very useful.	

Coumarin (Tonkin bean), especially in combination with *Otto of Roses*, has the power of hiding the smell of iodoform. One part of each to 98 of iodoform.

DRUGS EMPLOYED IN THE MOUTH FOR THEIR MECHANICAL EFFECTS.

Certain official and non-official drugs are employed in the mouth by the dentist, not for their action on tissues, but as DETERGENTS (cleaning agents; *detergeo*, I wipe away), PROTECTIVES, SOLVENTS, or DEHYDRATORS.

Calcii Carbonas Precipitata. PRECIPITATED CALCIUM CARBONATE. CaCO_3 .

Synonym. Precipitated Chalk.

Dose. 10 to 60 grs.

Forms the base of most DENTIFRICES. Is slightly antacid and astringent. From its insolubility is likely to remain long if brushed into crevices, and so form a nidus for collection of calculus, or irritate the gums. It is not likely to abrade the teeth if used in small quantities and with care. It is an antisialagogue.

Os Sepiae. POWDERED CUTTLE-FISH. Not official.

Sometimes added in small quantities to dentifrices from which a more thorough scouring action is required. Its use is, as a rule, best avoided as likely to abrade the enamel and particularly any exposed portion of the roots.

Potassii Hydras. See p. 23.

Preparation. Liquor Potassae (27 grs. to 1 oz.).

Liquor Potassae is a useful ingredient for a mouth-wash. It has a SOLVENT action on epithelial debris, inspissated mucus, and old blood-clot; is also antacid. See p. 94. Has a disagreeable soapy taste and feel, and reduces the flow of saliva.

Sapo Durus. HARD SOAP.

Synonym. Sodium oleate.

From its CLEANSING action is a useful ingredient of tooth powders, to form 15 to 20 per cent. by weight of the total, or may be used alone. Soaps may be classified as: 1, superfatted; 2, alkaline; according as to whether the fatty constituents predominate or some free alkali is present. "Castile" soap (*sapo Hispaniensis*), which is made with olive oil, is more pleasant than ordinary varieties, as having less taste. Soap has an antisialagogue action, but this may be overcome by the addition of aromatic flavours.

Mastiche. MASTIC. No longer official.

Source. A resin obtained from *Pistacia lentiscus*.

Solubility. Insoluble in water,
Partly soluble in alcohol (90%),
2 in 1 of ether,
2 ,, 1 ,, chloroform.

A solution of mastic is much employed in dentistry, applied on cotton-wool as a temporary PROTECTIVE filling. By evaporation of the solvent and precipitation of the resin by the saliva a hard mass results

which will endure for several days. The addition of hydronaphthol to the wool renders these dressings antiseptic. (See p. 89.)

A useful formula for solutions is as follows :—

Take of mastic, 2 ounces.

„ alcohol, 1 ounce.

Dissolve and decant after a few days.

Gum *sandarac*, *copal*, *dammar*, and *Friar's Balsam* (see p. 90) are often used instead of mastic. Their action is the same, though sandarac is said to have the least taste. Copal must be dissolved in ether, and hence is more difficult to keep.

Paraffinum Durum. HARD PARAFFIN.

Synonym. Paraffin wax.

A wax soft enough to pass through a blunt hypodermic needle when heated to 80° F. is useful for injecting into pyorrhœa pockets, after cleansing. It assists drainage and prevents irritation by lubricating the teeth. Perchloride of mercury 1 in 500 may be added and will not cause an objectionable taste.

Hard paraffin forms a most efficient PROTECTIVE for cement fillings while the latter are hardening.

It may be dissolved in xylol and the solution painted on, the solvent then being evaporated ; or a small piece, being placed in contact with the filling, may be melted and spread over the surface by the hot air blast.

Paraffinum Molle. SOFT PARAFFIN.

Synonym. Vaseline.

Soft paraffin (vascline) is less effective for protecting cements, but is used temporarily, to prevent evaporation of moisture during setting. It is, however, a useful protective to tissues surrounding a spot to which it is desired to apply a mineral acid, also for cracked lips and sore places around the mouth causing trouble during operation. Vaseline is often used as a base for ointments, but is *not* absorbed, so should not be used where the incorporated drug is required to penetrate.

It is also used as a coating for impression materials.

Collodium. COLLODION.

Composition. Pyroxylin 1, dissolved in ether, 36, and alcohol, 12.

Preparation. *Collodium flexile* (collodion 48, Canada balsam 2, castor oil, 1).

Collodion may be used for similar PROTECTIVE purposes as described under paraffin. *Flexile collodion* does not crack, as does collodion. They are both highly inflammable.

Tragacantha. See p. 122.

Powdered tragacanth, from its property of forming a sticky paste with water, is useful for securing adhesion of upper artificial "suction" plates for the first day or two after insertion, until perfect co-adaptation to the mouth is secured.

Tragacanth may be used to suspend or emulsify drugs difficult of solution in water.

Example.—Turpentine, magnesia.

Gossypium. COTTON.

Synonym. Cotton-wool.

Source. The hairs covering the seeds of *Gossypium barbadense*, from which the fatty matter has been removed.

This is called "absorbent cotton-wool," in contradistinction to ordinary "non-absorbent cotton-wool," which contains 10% of fixed oil. "Non-absorbent" cotton may be used as a root filling, and is less likely to collect septic matter than the "absorbent." Cotton is used to make *pyroxylin*. Its other uses are well known, and need not be described here.

Alcohol Absolutum. See p. 160.

From its readily combining with water, is employed to remove the last trace of moisture from roots and cavities before filling. For this purpose the alcohol must be freely used, then removed by mopping, and the last traces by hot air.

Note.—In live teeth the evaporation of the drug often causes severe pain from the cold produced.

Acidum Hydrofluoricum. HYDROFLUORIC ACID. HF_2 .

Preparation. Bifluoride of Ammonia.

J. Head states that a 48% solution of hydrofluoric acid will not harm enamel nor cementum, but will decalcify dentine and dissolve tartar. This acid is much too irritant to use in the mouth, but the acid salt of ammonium fluoride is found to be an effective solvent of tartar and yet sufficiently non-caustic (if not allowed to dry on the gum) to permit of application to pyorrhœa pockets for two minutes, twice a week, after the ordinary sealing and cleaning.

Chloroformum. See p. 203.

A useful SOLVENT of gutta-percha. Used to smooth gutta-percha fillings (though open to the objection that it is apt to make the surface porous), and for introduction into the roots of teeth before filling with gutta-percha points to secure perfect adaptation. A solution of gutta-percha in chloroform (chloro-percha) may be used for the latter purpose.

Oleum Cajuputi. OIL OF CAJUPUT.

Source. The oil from the leaves of *Melaleuca leucodendron*.

Pharmacology and Therapeutics.

Is one of the group of *aromatic oils*, and has similar properties to oil of cloves (see p. 112). Is a *solvent* of gutta-percha, and is used for the same purpose as chloroform. Its antiseptic action makes it appropriate for root treatment; also, as the merest trace, to secure adhesion of gutta-percha fillings.

Oleum Eucalypti. See p. 92.

As a SOLVENT of gutta-percha, with antiseptic action (see above).

Alum. See p. 37.

A half-saturated solution of alum, coloured by the addition of a little cochineal, is very useful for hastening the setting of plaster of Paris. It may be used either at this strength or diluted, as occasion may demand.

Alum not only hastens the setting of plaster, but also reduces its expansion and hardens the cast.

BLEACHING AGENTS.

Sound enamel of teeth cannot be stained interstitially in the mouth, and green stains, tobacco stains, and such like can be removed by mechanical means, or with iodine followed by ammonia.

Caries of the enamel, especially if slow and intermittent, renders the enamel porous and brownish. This brownish appearance is probably due to the altered refractive properties of the enamel, and cannot be removed by bleaching.

Dentine is readily stained, and the enamel being translucent, the stain will show through.

The discolouration of dentine may be caused by :—

1. Contamination from such substances as tobacco, tannin, port wine, iron medicines.
2. Chromogenic bacteria.
3. Metallic stains, as from amalgams, silver nitrate, copper sulphate, nickel posts, or the effect of drugs on steel instruments or gold fillings.
4. Drugs used in treating teeth, such as iodine, essential oils (cloves, cinnamon, etc.), creosote, aristol, beta-naphthol, tannin.
5. Hæmoglobin and its derivatives.

The first step in bleaching a tooth is to remove all the softened dentine and cleanse the pulp cavity. This will remove the greater part of the stain in most cases, and by a little sacrifice of sound stained dentine the tooth may usually be restored to its normal colour. This applies particularly to the first two causes of staining, which are also the most common in young subjects.

Metallic stains are much more difficult to deal

with. The chlorine method, followed by hot distilled water, is at times of use.

It is said that solutions of cyanide of potassium, a most dangerously poisonous drug, will remove silver nitrate stains ; it must not be used in the mouth.

Solutions of iodine and the iodides administered internally have the power of dissolving out metallic compounds from the tissues, and rendering them soluble. This method may be employed for the treatment of the lead line on the gums, and iodine may be used for local application, followed by solutions of ammonia or sodium hyposulphite for treating the metallic stains in teeth. The authors cannot say how far this action is of practical service.

Oxidising agents appear to be the most effective in bleaching the organic drug stains. Ammonia will remove iodine stains.

The stains in teeth produced by death or hyperæmia of the pulp are due to the deposit of hæmoglobin in the dentine ; this after a while, from its own metabolic changes, becomes reduced hæmoglobin and shows through as more or less black.

The application of any oxidising agent will reoxidise this, if still fresh, and produce a pink discolouration in place of the black.

In course of time other derivatives of hæmoglobin are formed, and the pink becomes a yellow stain.

Eventually the iron may become separated from its proteid combination and united with other elements, such as sulphur formed from the decomposition of fibrils, and so produce grey colours.

The admission of air and bacteria to a dead and degenerated pulp will sometimes lead to a rapid discolouration of the tooth.

The numerous methods of bleaching teeth all depend on the action of either :—

- | | |
|--------------------|-------------------|
| 1. Oxygen | O. |
| 2. Sulphur dioxide | SO ₂ . |
| 3. Chlorine | Cl. |
| or 4. Iodine | I. |

The first three are able to form new colourless compounds with many pigments, and the last acts by rendering the stain soluble ; after which it may be removed by thorough irrigation, or decolourised by ammonia if necessary.

Bleaching agents depending on the use or formation of acids appear to us apt to do more harm than good, and their use should be avoided when possible.

The rubber-dam should always be applied and only the one tooth exposed, so that no other teeth or tissues may suffer from the possible ill-effects of the drugs used.

After any of these methods have rendered the tooth white, it should be at once filled with a white filling, such as zinc-oxychloride or zinc-oxyposphate, and this eventually covered with a hard filling.

Oxygen.

Various means of applying oxygen to the dentine have been suggested.

1. *Liquor Hydrogenii Peroxidi*.
2. Sodium Peroxide, followed by dilute solutions of sulphuric, hydrochloric, or trichloroacetic acids.
3. Pyrozone (25%. H_2O_2).
4. Perhydrol (Merck) (30%. H_2O_2).

Oxygen acts by uniting with the stain, and so producing a new and colourless compound,

The principal difficulty in bleaching with oxygen is to get the oxygen to penetrate the dentine. The tooth has to be first thoroughly cleansed, the rubber-dam applied, and the apical portion of the root solidly filled, after which the drug chosen is applied freely and, if necessary, sealed in for some time.

Liquor Hydrogenii Peroxidi. See p. 74.

Will liberate nine volumes of oxygen for each volume used, but soon becomes exhausted, so that dressings of it are of little use. No after-treatment is necessary, as the waste product is only water. The presence of *aluminium chloride* increases the rate of liberation of oxygen.

Sodii Peroxidum. See p. 75.

Can be used in stronger solutions, hence it is a more powerful agent. Also the product of decomposition is not water, but caustic soda, which is a solvent of fatty material and even of cells also, thus increasing its penetrating and cleansing power. Warm water is much preferable to acids for removing the resulting caustic soda. It is employed as a saturated solution on asbestos fibre, as it dissolves cotton-wool. Sodium peroxide is a powerful, penetrating caustic.

Pyrozone. Non-official.

Is a solution of hydrogen peroxide in water (3% solution), or ether (5% or 25% solutions). It is mainly this last which is used for bleaching. The oxygen is said to be given off slower, and so dressings may be scaled in the cavity and left. The addition of an alkali seems to increase the activity of this preparation, or the oxygen may be made to penetrate further by **Electrophoresis** (anaphoresis) (see p. 101), in which case use an aqueous solution of 25% pyrozone, made by shaking together equal quantities of water and 25% pyrozone and evaporating the ether, and add 1% of zinc sulphate to reduce the electric resistance and also render the bleaching more permanent. Pyrozone is caustic.

Perhydrol. Non-official.

Is a 30% solution of peroxide of hydrogen, containing 100 volumes of available oxygen per volume, and is neutral in reaction. It is prepared by neutralising 20% sulphuric acid with sodium peroxide. It is a powerful caustic, and must be kept in a cool place to prevent deterioration. The pressure from the evolution of oxygen has been known to be sufficient to drive a soft root-filling through the apical foramen of a tooth.

Sulphur Dioxide.

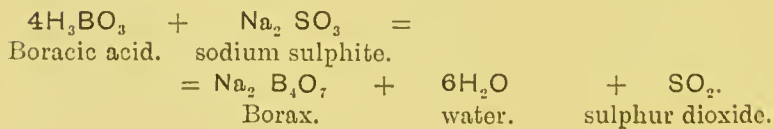
Sulphur dioxide is able to combine with pigments and form a colourless compound.

It is usually produced by filling the cleansed cavity with a mixture of sulphite of soda and boracic acid, then moistening the mixture and sealing it in; when sulphur dioxide will be produced and bleach the tissues. There will be a certain amount of acid reaction.

Sodii Sulphis. SULPHITE OF SODA. $\text{Na}_2 \text{SO}_3, 7\text{H}_2 \text{O}$.
Non-official.

Dose. 15 to 60 grs.

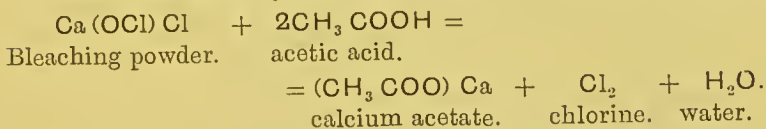
Characters. A white crystalline salt, which readily decomposes into the sulphate if exposed to the air. Sulphur dioxide is produced by packing the cavity with a mixture composed of 100 grs. of *sodium sulphite* and 70 grs. of *boracic acid*, mixed quite dry, and then adding water to bring them into solution.



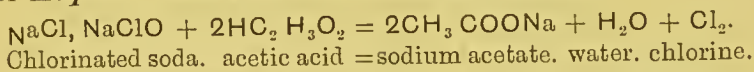
Chlorum. See p. 43.

Incompatible with gold and amalgam fillings.

Many ways of producing chlorine have been introduced, such as the use of *calcium hypochlorite* and any acid, *e.g.*, *Acetic*.



or *Liquor Sodae Chlorinatae* and an acid.



or the *free gas* as applied to the tooth by a special apparatus, or chlorine water swabbed in.

Chlorine is capable of uniting with pigments and forming a colourless salt, or of uniting with the hydrogen of water, and liberating nascent oxygen, thus acting either directly or indirectly on the stain.

The chlorine compound selected is packed into the cavity, and then the chlorine is liberated by the action of some dilute acid—which, does not matter much—and the cavity sealed up.

The objections to the use of chlorine are that it involves either the use of acids to liberate the gas, or the formation of hydrochloric acid as a result; and as the chloride of the stain remains in the tooth, and is liable to reduction, the staining may, and sometimes does, return.

Iodum. See p. 77.

Iodine and the iodides have the power of forming soluble salts with some of the metals, such as silver, mercury, copper, and iron, which can then be washed out of the tissues by suitable media. As I

Iodine has thus been used to dissolve the stains of silver nitrate, which are then washed away with solutions of *ammonia*. The internal administration of the iodides will remove in time the "blue line" produced in lead poisoning.

PART II.

PURGATIVES.

Medicines which cause an increased action of the bowels.

Other means than the administration of drugs by the mouth are at the disposal of the physician for obtaining evacuation of the bowels. **Enemata** (clysters), or liquids injected into the rectum, from their action in directly stimulating the muscular coat and thus promoting peristalsis, are frequently of service, especially when it is desired to act upon the lower part only. A good form of laxative enema is $\frac{1}{4}$ to 1 pint of warm soapy water thrown in with a suitable syringe; or a drachm of glycerine may be employed, which, from its attraction of water, increases osmosis and intestinal secretion.

In chronic constipation, a suitable diet, regular exercise, and abdominal massage are of the greatest service.

Purgative drugs are classified as follows:—

1. **LAXATIVES.** Substances which increase the action of the bowels moderately by stimulating the muscular coat, thus augmenting peristaltic action.

Example.—*Whole-meal bread, figs, manna, sulphur, magnesia, and castor oil* (in small doses).

Liquid paraffin is supposed by its lubricating action to accelerate the passage of feces.

2. **SIMPLE PURGATIVES** increase peristalsis actively and also increase glandular secretion; they may cause griping and some irritation.

Examples.—*Aloes, cascara sagrada, senna, rhubarb, magnesia, and castor oil* (in full doses).

3. DRASTIC PURGATIVES OR CATHARTICS.

Greatly increase secretion and peristaltic movements, and if given in large doses cause severe griping pain, profuse diarrhœa, catarrh of the mucous membrane, secretion of mucus, and even hæmorrhage from the bowels; frequently much prostration and collapse.

Examples.—*Colocynth, jalap, elaterium, croton oil.*

4. SALINE PURGATIVES. These greatly increase the secretion of intestinal fluid, which accumulates in the bowel till peristalsis is excited, when an easy evacuation is produced. How saline purgatives act is not quite clear, but it has been ascribed to a disturbance of the process of osmosis in the intestinal wall, and in part to some specific action of the salts upon the structure of the latter.

Examples.—*Magnesium sulphate, sodium citrotartrate, potassium sulphate.*

v. **Hydragogue Purgatives.**—Purgatives are called hydragogue when they cause a large amount of watery secretion. They include the most active of the drastic and saline groups.

vi. **Cholagogue Purgatives.**—Purgatives are so named when their action is accompanied by an increased secretion and evacuation of bile. They may act either (a) directly on the liver cells (direct cholagogues),

Example.—*Podophyllin.*

or (b) by stimulating the duodenum and upper part of the jejunum, and thus sweeping on the bile before it can be reabsorbed (indirect cholagogues).

Example.—*Calomel.*

Purgatives are employed in general medical practice in the treatment of many diseases, and for purposes too numerous to be specified here. For the dentist their chief use is as an auxiliary measure in the treatment of acute inflammatory disturbance in its early stage.

Example.—Acute periodontitis, acute gingivitis.

In all acute inflammations the clearing out of the bowels is an important preliminary therapeutic measure to be adopted, *except* in acute inflammatory abdominal affections, when, as a rule, purgatives are best avoided. This treatment is directed partly to the constitutional disturbances to which the acute inflammation gives rise, and partly to the local condition, on which, indeed, the general state reacts.

The rationale is as follows :—

i. By purgation elimination of noxious products of inflammation is assisted, the intestinal tract being an important channel for the elimination of such products from the blood.

In cases of inflammation in various parts of the body as a result of alimentary toxæmia, the absorption of poisons may be considerably reduced by purgative treatment.

ii. Purgation, by causing dilation of the vessels of the alimentary canal, **reduces blood-pressure** in other parts ; and if “hydragogues” be employed, the volume of circulating fluid may be diminished.

iii. **The body temperature**, elevated in acute inflammations, and the elevation aggravated by constipation, is frequently reduced.

iv. **Digestion is improved** and assimilation of food favoured.

For acute inflammations occurring in dental practice the most suitable of the groups described above are the **simple purgatives** and the **salines**. Many of the latter have the additional advantage of possessing some diuretic and diaphoretic action in addition, and thus assisting in the elimination of morbid products.

A mercurial purge (calomel), followed by a saline, is frequently of great utility, though, be it remembered, from idiosyncrasy, some persons are unable to take mercurials in any form.

Other Uses.

It is advisable, as a routine practice, to clear out the bowels, by means of a mild purge or enema, before administration of a general anæsthetic, especially where the patient is to be kept under for any length of time, as in chloroform and other narcosis. Neglect of this precaution may lead to an evacuation during the operation.

Purgatives are usefully employed in the treatment of convulsions due to teething; in the treatment of chronic constipation, which aggravates such morbid conditions of the mouth as are met with in pyorrhœa alveolaris; in the treatment of neuralgic affections; and in treating chronic dyspepsia and anæmia—diseases very destructive to the teeth. These conditions are, however, as a rule, best left to the care of the medical practitioner.

By the too frequent use of purgative drugs, atony (weakening of normal movements and secretion) of the bowels is likely to result.

Purgative drugs being very numerous, a few of the most useful only are dealt with in the following chapter.

Oleum Ricini. CASTOR OIL.

Materia Medica.

Source. The oil expressed from the seeds of *Ricinus communis*.

Dose. 1 to 8 drs.

Characters. Viscid; colourless, or pale yellow: unpleasant taste; characteristic faint odour.

Solubility. 1 in 5 of alcohol.

Preparation. Mistura Olei Ricini. (B.P.)

Castor oil, 3 oz.; orange flower water, 1 oz.;
mucilage of acacia, $1\frac{1}{2}$ oz.; cinnamon water, $2\frac{1}{2}$ oz.
Strength, 3 drs. castor oil in 1 oz.

Dose. 1 to 2 oz.

Pharmacology and Therapeutics.

Locally is a sedative and protective, like almond oil.

Taken internally is a LAXATIVE, or SIMPLE PURGATIVE, according to the dose. Produces an action of the bowels in from four to six hours. Castor oil is the best of the simple purgatives, as it causes no griping or subsequent constipation. The only objection to its use is the nauseous smell and unpleasant taste. The latter is much less conspicuous in the "cold drawn" variety, and may be concealed by the addition of peppermint water and a little brandy, the draught being prepared so that the oil forms a "middle layer." Or the official mixture may be given.

Senna. The dried leaves of *Cassia angustifolia* and *Cassia acutifolia*.

Preparations. Mistura Sennae Composita

(Black draught).

Sulphate of magnesia 5 oz., extract of liquorice 1 fl. oz., aromatic spirit of ammonia 1 fl. oz., compound tinct. of cardamoms 2 fl. oz., infusion of senna to 20 fl. oz.

Dose. 1 to 2 fl. oz.

Infusum Sennae Compositum. (U.S.P.)

Pulvis Glycyrrhizae Compositus

(Liquorice powder).

Senna 2, liquorice root 2, fennel 1, sublimed sulphur 1, sugar 6.

Dose. 1 to 2 drs.

Pharmacology.

Senna is one of the most useful of simple vegetable purgatives, stimulating the muscular coat of the bowels and producing brisk peristalsis and purgation in about five hours. It has a strong tendency to gripe if given alone, and is consequently always combined with some "carminative" as a corrective to check this effect, as in the B.P. preparations given above.

*Senna Pods
Better than
Leaves.
Leaves contain
griping principle.*

Therapeutics.

Mist. Sennae Co. (black draught), given as a full dose (2 ounces), is a useful, smart purge for a strong adult; its action depends more on the sulphate of magnesia that it contains (see below) than on the senna. **Compound liquorice powder** is a more pleasant preparation to take, and to be preferred for children and delicate persons; the sublimed sulphur contained in it also has a laxative effect.

Magnesii Sulphas. SULPHATE OF MAGNESIA.
 $\text{Mg SO}_4, 7\text{H}_2\text{O}.$

Materia Medica.

Synonym. Epsom salts.

Characters. Small, colourless, transparent, rhombic prisms, possessing a bitter taste.

Dose. 30 to 120 grs. for repeated administrations.
 $\frac{1}{4}$ to $\frac{1}{2}$ oz. for single administration.

Preparation. **Mistura Sennae Composita.** 1 oz.
 in 4 fl. oz.

Dose. 1 to 2 oz.

Pharmacology and Therapeutics.

Sulphate of magnesia is the most useful of the SALINE PURGATIVES (see p. 141). It is markedly "HYDRAGOGUE" in its action. May be prescribed

L

as the *mist. sennae co.*, or, if for repeated administrations, as the "*haustus albus*" of most hospital pharmacopœias.

R.

Magnesii Sulphatis 5 j.
Magnesii Carbonatis gr. x.
Aquam Menth. Pip. ad $\frac{3}{4}$ j.

Misce. Fiat mistura. Mitte doses iv.

Signa. Two tablespoonfuls to be taken every four hours.

The CARBONATE and OXIDE OF MAGNESIA act in the mouth and stomach as antacids (see p. 93). Taken internally they are decomposed by the gastric juice, and have a purgative effect similar to that of the sulphate, but not so powerful.

Soda Tartarata. TARTARATED SODA, SODIUM POTASSIUM TARTRATE.

Preparation. Pulvis Sodae Tartaratae Effervescens. (Seidlitz Powder.)

In blue paper: Tartarated soda, 120 grs.
 Sodium bicarbonate, 40 grs.

(Mixed.)

In white paper: Tartaric acid, 38 grs.

Dose. Dissolve the powder in blue paper in half-pint of water, add contents of white paper, and drink while effervescing.

Pharmacology and Therapeutics.

Seidlitz Powder is a familiar and efficient SALINE PURGATIVE. This property is mainly due to the tartarated soda contained in it, though the gas (CO_2) evolved during the effervescence increases the effect by mechanically stimulating peristalsis. If taken in the morning on an empty stomach, an easy action of the bowels is obtained in two or three hours.

Hydrargyrum. MERCURY. See also pp. 67 and 171.

Preparations. Hydrargyrum cum Creta (Grey Powder).

1 of mercury with 2 of prepared chalk.

Dose. 1 to 5 grs.

Pilula Hydrargyri (Blue pill).

Massa Hydrargyri. (U.S.P.)

Mercury 1, confection of roses $1\frac{1}{2}$, liquorice $\frac{1}{2}$.

Strength, 1 in 3 of mercury. Dose. 4 to 8 grs.

Hydrargyri Subchloridum (Calomel, Mercurous Chloride).

Hydrargyri chloridum mite. (U.S.P.)

Dose. $\frac{1}{2}$ to 2 grs.

Pharmacology.

Mercury and its salts are PURGATIVE, ANTISYPHILITIC, PARASITICIDE, DISINFECTANT, ASTRINGENT, DIURETIC.

PURGATIVE. The action of mercurials as purgatives is a purely local one, none of the metal being absorbed, but all expelled in the fæces. The purgative effect is produced by an irritant action of an obscure nature, increasing secretion and peristalsis chiefly on the duodenum and upper part of the jejunum. The bile is hurried onward before it can be, as ordinarily, reabsorbed; thus mercurials have an indirect cholagogue action.

Therapeutics.

Calomel is a most useful purgative in cases where there is reason to suspect hepatic congestion. It is often followed by a saline (*mist. sennae co.*) to

complete the effect. Griping sometimes occurs. *Calomel* is best prescribed in the form of a pill ; either alone,

Rx.

Calomelanos gr. ij.

In forma pilulae.

Nocte sumendum.

or in combination with a vegetable purgative,

Rx.

Hydrargyri Subchloridum gr. j.

Extracti Colocynthydis Co. gr. iij.

Extracti Hyoscyami gr. j.

Fiat pilula.

In the latter prescription the *hyoscyamus* is added as an adjuvant (as it increases peristaltic action) and corrective (as it relieves the griping).

Grey powder is useful for administering to young children, either as a purgative or antisiphilitic remedy. See p. 171.

TONIC STIMULANTS.

Tonics are therapeutic agents which impart permanent strength to the body or its parts (Brunton). Their action is indirectly to give "tone" to the system by improving the action of one or more organs of the body, and is necessarily a gradual one.

Frequently of greater efficacy than medicines as tonic agents are fresh air, light, change of climate, baths, massage, electricity, exercise, suitable diet.

Tonic drugs may be pharmacologically classified as follows, and may act—

1. Through the circulatory system.

These may be sub-divided into—

- (a) Those acting on the BLOOD (hæmatinics), causing an increase in the total number of red corpuscles, and an increase in the percentage of hæmoglobin (the plasma is but little affected by drugs).

Example.—Iron.

- (b) Those acting on the HEART AND BLOOD-VESSELS (cardiac and vascular tonics), which increase the force of the heart's contraction and overcome any tendency to vascular dilatation.

Example.—Digitalis.

2. Through the alimentary system. These are the gastric and intestinal tonics, and act by causing increased secretion of gastric and intestinal juices, dilating the vessels and increasing absorption, or augmenting movements. They reflexly increase the appetite for and enjoyment of food ; and for these various reasons generally raise the standard of nutrition.

Example.—Vegetable bitters, mineral acids.

3. Through effect on metabolism in the tissues (alterative tonics).

So little is known exactly concerning ordinary healthy metabolism, that although this process can be certainly modified by suitable means, the precise action of drugs is obscure.

Example.—Arsenic.

4. Primarily through the nervous system (nervous tonics). By increasing the activity of the nervous centres, in many cases an improvement results of all the nutritive functions, through stimulation of the vaso-motor mechanism, and greater activity of heart and systemic muscles.

Example.—Strychnine.

5. As true foods, improving nutrition generally.

Example.—Cod-liver oil.

Tonic agents are employed in conditions of debility. They thus find useful application for the treatment of patients convalescing from acute illness, suffering from prostration as the result of overwork, mental anxiety, or the shock of surgical operations. They

are frequently of great service as adjuncts in the treatment of chronic organic diseases (such as phthisis and heart disease), and as direct therapeutic agents in anæmia and chlorosis, in which hæmatinic tonics have a very marked beneficial effect. In fact, their uses in medical and surgical practice are too varied and numerous to be specified here.

It must be clearly understood, however, that tonic measures alone will not restore a debilitated patient to health while a specific cause for the debility continues to exert influence. Let it be repeated here that administration of medicines, though a measure of great value, is not the only, or always the best, therapeutic means at our disposal.

To the dentist, tonic remedies are chiefly of interest in their application to the treatment of—

1. Debility arising from conditions that he is called upon in the first place to remedy.

Example.—Prolonged suppuration in the mouth from stumps of teeth or pyorrhœa alveolaris.

2. Weakness arising out of shock or prostration, the result of dental operations.

Example.—Several sittings for the extraction of a number of teeth.

3. The treatment of morbid constitutional states in children, which result in imperfect formation and delayed and difficult eruption of the teeth.

Example.—Rickets, marasmus.

4. In treatment of diseases favourable to production of dental caries.

Example.—Anæmia, dyspepsia.

5. In the treatment of various neuralgic affections which simulate those caused directly by diseases of the teeth.

The Authors of these "Notes" are of opinion that it is not, as a rule, desirable that the dentist who has not received a general medical training, in addition to his special one, should prescribe tonic remedies for his patients. As will be gathered from what has been said above concerning the action of tonic drugs, their various actions are so diverse in nature that considerable medical diagnostic skill is required for their efficient employment; and in unskilled hands more harm than good may result. Therefore, although from conditions arising in dental practice it may be clear that tonic remedies are indicated, the dentist on recognising this should refer the patient to a medical practitioner.

In the following a brief résumé is given of the pharmacology, therapeutic application, when administered internally, and toxicology of the most important member of each class of tonic drugs. Materia medica, dosage, and prescriptions are omitted.

Iron Preparations.

Pharmacology and Therapeutics.

Taken by the mouth, blacken the teeth and tongue owing to formation of the sulphides, though, except in acid preparations, they probably have no other ill effects (see p. 236). In the stomach they are converted into ferric chloride, and from the astringent properties of iron salts (see p. 53) are very apt to occasion derangement of digestion, though some preparations have this effect much less than others. In the intestine oxides, carbonates, sulphides, and lactate of iron are formed, and in excess are very likely to cause constipation, again from astringent

action. Nothing is known with certainty concerning the form in which iron is absorbed, though the modern view is that such absorption certainly takes place. The great bulk is carried into the lower part of the intestine, where the epithelium and leucocytes probably absorb some in solid form and some in solution. The iron passes through the lymphatics and mesenteric glands to the blood-vessels, and is then deposited to a large extent in the spleen, and thence passes to the liver and bone marrow. When there is a deficiency of iron in the blood, the liver yields up some, and excretion takes place ultimately through the cæcum and large intestine. Iron is the most valuable HÆMATINIC TONIC we possess in cases of simple anæmia and chlorosis, increasing the number of red cells in the blood and the percentage of hæmoglobin. It is also useful in combination with other tonic remedies during convalescence after long illness. Freshly prepared carbonate of iron is the best antidote in acute arsenical poisoning, an insoluble arsenite of iron being formed, which is then got rid of by a purge. (See p. 18.)

Digitalis and its preparations.

Pharmacology and Therapeutics.

When administered internally are rapidly absorbed. The heart is slowed, diastole is prolonged, and the force of systolic contraction greatly increased; this is chiefly due to the direct effect of the drug on cardiac muscle. Blood-pressure is raised generally by contraction of the arterioles, partly through action on their muscular coat, partly from a stimulation of the vascular centres. Digitalis also has a diuretic action.

This drug is chiefly employed in cases of cardiac disorder. It may be regarded as a true CARDIAC TONIC, as by its use in suitable cases permanent strength will accrue to the cardiac muscle. On the

vessels it will overcome the tendency to dilatation, shown by congestion and œdema of dependent parts, drowsiness in the upright and wakefulness in the recumbent posture.

Note.—*Digitalis* is a drug *never* to be administered except by a properly qualified physician, as in many cases of heart disease, requiring skill for their diagnosis, it is contra-indicated. The above short description is only inserted in these "Notes" for the sake of completing the classification.

Vegetable Bitters (of which *calumba* may be taken as a type).

Pharmacology and Therapeutics.

Bitters increase appetite for food, when taken internally, by stimulation of gustatory nerves; this reflexly leading to dilatation of gastric vessels, and an increase of gastric secretion. When reaching the stomach bitters are absorbed, and still further stimulate the flow of gastric juice, and peristalsis is rendered more active. They are thus **ADJUVANTS TO DIGESTION** and indirectly improve general nutrition. Bitters are used commonly in tonic prescriptions for the above-mentioned effects in combination with other drugs, and are of chief service in cases where some dyspepsia exists from a feebleness in function of all the bodily organs, as in anæmia, general exhaustion, and convalescence from acute disease. *Strychnine* and *quinine*, when given in small doses, owe their tonic properties largely to their action as bitters.

Dilute Mineral Acids (of which *dilute nitro hydrochloric acid* may be taken as a type).

Pharmacology and Therapeutics.

Rouse the appetite and aid digestion by increasing the salivary flow, and indirectly and reflexly that of the gastric juice. The acidity of the contents of the stomach is increased, by which **DIGESTION IS AIDED**,

and the increased acidity of the chyme increases peristalsis. The flow of bile is increased. Upon the intestines some dilute acids (especially sulphuric) have an astringent action. Mineral acids are employed in the treatment of dyspepsia in cases where too little acid is secreted by the stomach, also, from their cholagogue action, in cases of "hepatic" dyspepsia. Their tonic action is referable to their stimulating effect upon the gastric and biliary functions.

Arsenic. See p. 14.

Pharmacology and Therapeutics.

Arsenic preparations, taken internally in minute doses, act as gastric stimulants, dilating the vessels and causing an increased flow of secretion. In large doses they are apt to act as gastro-intestinal irritants. Arsenic is absorbed into the blood, and in some forms of anæmia acts as a hæmatinic, increasing hæmoglobin and the number of red cells. In the tissues METABOLISM IS ALTERED, though the exact influence is still obscure; possibly by lessening oxidation and tissue waste. There is no doubt, however, that an improvement in nutrition results, and arsenic is the most valuable of the "alterative" tonics.

Arsenic is used in some forms of dyspepsia, anæmia, and chronic skin diseases, as an antiperiodic in malaria, in neuralgia having a malarial origin, and in the treatment of syphilis. (See p. 174.)

Toxicology. Acute. See p. 18.

Strychnine. See p. 164.

Pharmacology and Therapeutics.

Strychnine, being intensely bitter, in the stomach acts as a "gastric" tonic in precisely the same way as described under "bitters." In the intestine peristalsis is increased, and some purgative action

may result. Being absorbed into the blood, its effects are soon manifested on the **NERVOUS SYSTEM**. These consist in a powerful stimulation of the anterior cornua of the grey matter of the spinal cord and medullary centres (respiratory and vaso-motor). The heart is stimulated and blood-pressure raised.

Strychnine is a tonic drug of great value, from its gastric and intestinal effects and as a nervous stimulant. As stated above, all the digestive functions benefit by an increased activity of the nerve centres.

Toxicology.

A quarter of a grain has proved fatal.

Symptoms of poisoning.

Bitter taste.

Feeling of suffocation and difficulty in breathing.

Twitching of muscles, soon passing into (intermittent) tetanic convulsions of all the muscles of the body, which come on in paroxysms.

Opisthotonos and intense pain in contracted muscles.

Treatment.

Put patient under chloroform or ether.

Wash out stomach with *permanganate of potash* solution (1 in 400).

Inject 20 grains of *chloral hydrate* and 30 grains of *potassium bromide* in solution into the rectum.

Cod-Liver Oil. OLEUM MORRHUAE.

Therapeutics and Pharmacology.

Cod-liver oil is liable to cause indigestion and nausea. When it can be taken, it is readily absorbed, more so than any other oil, and leads to the formation of fat. It is readily oxidised, and this may explain its value in increasing body weight, though it is supposed, in addition, to have some specific action

not yet understood. It acts as a **TRUE FOOD**. Used in wasting diseases, general feebleness, and neuralgic affections. It may be administered with the greatest advantage in cases of rickets.

Vaccine-therapy.

In Vaccine-therapy dependence is placed on the fact that the blood will form **OPSONINS** when a non-lethal dose of the germs is administered. **OPSONINS** are bodies that either diminish the resistance of the germs to the attack of the leucocytes, or attract the germs to these cells (chemiotaxis).

When a sufficient quantity of the opsonins are formed an **active immunity** (positive phase, increased opsonic index) is said to be established to that particular variety of germ.

When the **serum** of an immunised animal is injected no reaction occurs in the blood, and only a **passive immunity** is established proportional to the activity and quantity of the dose administered. This is **serum-therapy** as is used in diphtheria.

The immunity is only to the particular kind of germ which has been administered.

As it would be dangerous to inject the fully virulent germ, these are **attenuated** and the quantity given carefully regulated.

Vaccines containing attenuated organisms may be prepared :

1. By cultivating the organism outside the body on culture media.
2. By passing the organism through another species of animal.
3. By cultivation at a higher temperature.
4. By growing the organism in weakly antiseptic media.
5. By using cultures containing only dead organisms.

Vaccines are called **autogenous** when they are prepared from the germs growing in the actual lesion in the patient; they are called **stock** vaccines when they are prepared from some similar lesion in another patient. The latter are, possibly, not efficacious because they may not produce an opsonin appropriate to the germs causing the injury.

Immediately after the injection of a vaccine, the blood is at first less resistant to the germs (negative phase, lowered opsonic index), and the symptoms of the disease may be increased. A second dose given at this stage will still further lower the resistance and is very dangerous. After a few days the opsonins are formed and the resistance to the disease increases and remains high (positive phase, raised opsonic index) for some time. A second dose at this stage will not lower the resistance so much.

It is thus obvious that the vaccine acts as a specially beneficial stimulant to the blood, and will be useful in helping to heal a lesion if the cause can also be removed. In the case of such a disease as pyorrhoea alveolaris, vaccines will only alleviate symptoms and not even that while local irritation persists.

IMMEDIATE STIMULANTS.

Immediate Stimulants are agents which temporarily quicken some functional or trophic process.

Their utility is manifest in tiding over times of emergency by calling into use the reserve force of the body tissues. They do not add to the strength of the body, but by drawing on the reserve force prevent a cessation of essential function for the time. As reaction follows all increased output of energy, the latter has to be paid for by subsequent exhaustion at a period of less acute urgency.

Stimulants should therefore be used sparingly, and only in cases of real need for temporary additional strength, when the subsequent exhaustion will not be dangerous.

Stimulants may be applied to any of the physiological functions. Thus they may be classified as gastric, hepatic, renal, or nerve stimulants, etc. In these "Notes" we only deal with those likely to be of use in dental practice. These are :—

Cardiac and Cardio-vascular stimulants.

These may be either—

DIRECT, acting on the muscle tissue itself, such as digitalis, supra-renal extract, alcohol, ether, amyl-nitrite, artificial respiration.

INDIRECT—that is, through the medium of the nerves, such as strychnine, amyl-nitrite, slapping the face with a wet towel, lowering the head to increase the cerebral circulation, especially that to the cardiac centre.

Respiratory stimulants.

DIRECT. Artificial respiration.

INDIRECT. Those acting through the nervous mechanism—strychnine, amyl nitrite, ammonia, cold water to the surface, lowering the patient's head. Strychnine and alcohol also have a stimulating effect on the digestive organs, which increases their general effect.

The dentist should seldom employ stimulants, their use being almost confined to hastening the recovery of patients from slight attacks of syncope. Emergencies may arise when the call for their use is immediate and imperative, so that a knowledge of the means available for the purpose is necessary.

Example.—In collapse from cocaine poisoning, ammonia and artificial respiration may be necessary immediately in order to prevent death.

Alcohol. ALCOHOL. C_2H_5OH .**Materia Medica.***Preparations.*

<i>Alcohol dilutum.</i> (U.S.P.)	41%.	sp. gr. '936
<i>Proof spirit (Spiritus Tenuior).</i> (Non-official.)	49%.	sp. gr. '920
<i>Rectified spirit.</i>	90%.	sp. gr. '834
<i>Alcohol.</i> (U.S.P.)	92%.	sp. gr. '816
<i>Absolute alcohol.</i>	99%.	sp. gr. '794

Solubility.

Mixes in all proportions with water.
Will dissolve some fats and essential oils.

Pharmacology and Therapeutics.

ANTISEPTIC, DEHYDRATOR, ASTRINGENT, GENERAL
AND LOCAL STIMULANT, FOOD, ANTIPYRETIC,
ANODYNE, OBTUNDENT.

STIMULANT. Alcohol in a moderate single dose is a good cardiac stimulant, acting on the cardiac muscle directly and increasing the force of the contractions. The entire nervous system is also temporarily stimulated, but quickly depressed.

It should be given in the form of 2 oz. or 3 oz. of *brandy* or *whisky*, either pure or very slightly diluted; it acts quickly and surely. Hence it is very useful in the treatment of shocks or syncope. It is also very useful in small doses for treating chronic diseases of the heart, and in fever.

The dentist should only give alcohol in cases where it is urgently called for and other drugs will not serve as well, because it is a drug very liable to abuse. Its use is practically confined to cases of threatened cardiac failure from shock or heart disease.

ANTISEPTIC. Absolute Alcohol has an antiseptic action.

ASTRINGENT. In the form of evaporating lotions alcohol produces cold, and acts as an astringent.

FOOD. Alcohol is, to a small extent, oxidised within the body and so contributes to general nutrition.

ANTIPYRETIC. Alcohol increases the cutaneous circulation and perspiration, diminishes metabolism, and, in excessive doses, causes general depression, thus reducing the body temperature.

ANODYNE AND OBTUNDENT. See p. 115.

Ammonia. AMMONIA. NH_3HO .

Materia Medica.

Dose. Not given pure internally.

Solubility. 1 in 3 of water.

Preparations.

Liquor Ammoniae Fortis. 1 in 3.

Not given internally.

Aqua Ammoniae Fortior. (U.S.P.)

(28% NH_3 .) Not given internally.

Spiritus Ammoniae Aromaticus

(*Sal Volatile*). 1 in 30.

Dose. $\frac{1}{2}$ to 1 dr. (diluted).

Contains carbonate of ammonium, strong solution of ammonia, volatile oil of nutmeg, oil of lemon, rectified spirit, water.

Liquor Ammoniae. 1 in 10.

Dose. 10 to 20 mins.

Aqua Ammoniae. (U.S.P.)

(10% NH_3 .) *Dose.* 10 to 20 mins.

Ammonii Carbonas.

Dose. 3 to 10 grs.; 30 grs. as an emetic.

Pharmacology.

GENERAL STIMULANT, COUNTER-IRRITANT,
ANTACID, DECOLOURISING AGENT, EMETIC.

STIMULANT. Ammonia stimulates the central nervous system, especially the respiratory centre; it is also a local stimulant and a stomachic carminative, both of which latter actions reflexly induce general stimulation.

COUNTER-IRRITANT. The vapour of ammonia, if confined to the skin or mucous membranes, under a dressing, acts as an irritant, and will quickly raise a blister. Its action is so penetrating that it is seldom used for this purpose. Solutions used in liniments also have an irritant action.

ANTACID. The antacid properties of ammonia are not employed in the mouth, on account of its irritant action.

DECOLOURISING AGENT. See p. 139.

Therapeutics.

STIMULANT. It is very useful in restoring consciousness and proper respiratory activity. It may be administered by inhalation of the *vapour* itself, or given internally as **20 mins.** of the *liquor* diluted; as **1 dr.** of *sal volatile* diluted; or as **30 mins.** of a mixture of equal parts of *sal volatile* and *spiritus aetheris*, also well diluted. They all have the disadvantage of sometimes causing vomiting.

Ammonia is a good general stimulant, quick in its action, and indicated in sudden collapse from pain, cocaine poisoning, or nervous shock.

A better means than ordinary **Smelling Salts** of administering ammonia by inhalation is afforded by the employment of **Vaporoale Aromatic Ammonia** (B. W. & Co.), as these do not deteriorate by keeping and the contents are readily accessible. It is useless to employ this remedy unless the patient is inspiring freely, to which end some artificial respiration is often required.

COUNTER-IRRITANT. When removing iodine stains from the skin with ammonia, it must be remembered that an additional irritant is being applied.

Toxicology.

Strong solution of ammonia given undiluted is a corrosive poison.

Symptoms of poisoning.

Pain in throat, stomach and larynx.
Asphyxial symptoms.
Vomiting, purging.
Collapse.

Treatment.

Vinegar.
Tracheotomy if necessary.
Brandy and morphia.

Strychnina. STRYCHNINE.**Materia Medica.***Source.*

An alkaloid obtained from the seeds of *Strychnos nux vomica*.

Solubility.

Sparingly in water,
1 in 150 of alcohol.

Preparations.

Liquor Strychninae Hydrochloridi (1 in 100).

Dose. 2 to 8 mins.

Hypodermically, 2 to 3 mins.

Pharmacology and Therapeutics.**STIMULANT, TONIC.**

STIMULANT. Strychnine is a powerful nerve stimulant, and its continued use is attended with danger on account of its tendency to accumulate in the system, leading to convulsions and death.

To the dentist it may be useful as a stimulant,

administered subcutaneously (1 to 3 mins. of the *liquor*) in cases of cardiac and respiratory failure.

All the ordinary methods of resuscitation should be persevered with.

It is also the antidote to *opium* and *chloral hydrate* poisoning.

TONIC. See p. 155.

Toxicology. See p. 156.

Æther. See p. 201.

Pharmacology and Therapeutics.

GENERAL ANÆSTHETIC, STIMULANT.

STIMULANT. Ether has a similar, more rapid, but less persistent, action than alcohol, and may be used in place of the latter drug. It may be given by the mouth (60 to 90 mins. of the *spirit*), injected hypodermically (5 to 10 mins.), or hypodermically combined with strychnine (10 mins. *ether* and $\mathfrak{m}$. iij. *liquor strychninae*).

Amyl Nitris. AMYL NITRITE. $\text{C}_5\text{H}_{11}\text{NO}_2$.

Materia Medica.

Dose. Of vapour, 2 to 5 mins.; internally, $\frac{1}{2}$ to 1 min.

Solubility.

Readily in alcohol.

Almost insoluble in water.

Preparations.

Usually put up in glass capsules, wrapped in lint, containing 5 mins.

Pharmacology.

CARDIAC STIMULANT, VASO-DILATOR.

The vapour of amyl nitrite inhaled produces almost immediately marked effects upon the heart and circulation. All the vessels in the body rapidly dilate, a clinical manifestation of which is observed in flushing of the face. Throbbing in the head, giddiness, and dilatation of the pupil also frequently occur. The vascular dilatation is due to a direct action on the muscular coats of the smaller blood-vessels, and as the result of it blood-pressure rapidly falls.

At the same time the heart beats rapidly and violently, though the force of the pulse is not increased, owing to the general fall of blood-pressure. The net result is marked circulatory stimulation, the heart for the time being liberating more energy against a lessened resistance.

Therapeutics.

In general medicine amyl nitrite is used to relieve the pain in angina pectoris, and other paroxysmal cardiac pain. It is practically always administered by inhalation.

Amyl nitrite is only used by dentists in cases of threatened cardiac failure from the administration of anæsthetics. A capsule is broken and the patient made to inhale the vapour. Its effect is immediate, but it is necessary that the patient take an inspiration, or the drug is useless.

SPECIFICS.

Specifics are remedies which have a distinct effect in the cure of a special disease.

How some of these remedies act is only partially known.

The cure of disease may be effected by the employment of remedies concerning which we are enabled to definitely state a reason why they have this effect.

Example.—The cure of scabies by means of sulphur applications, this drug being known to kill the itch parasite.

This is **rational** therapeutics.

Or by using remedies whose efficacy is attested by experience *only*.

Example.—Chlorate of potash for stomatitis.

This is **empirical** therapeutics.

Most specific drugs are used empirically, though with advancing knowledge many methods of treatment, formerly wholly empirical, are now coming into the "rational" category.

The specific drugs of most interest to the dentist are :—

1. ANTISYPHILITIC remedies. Mercury, arsenic compounds, and potassium iodide.

2. ANTISCORBUTIC remedies (*scorbutus*, scurvy). Lime juice.

3. ANTISTOMATITIC remedies. Chlorate of potash, borax.

Potassii Chloras. CHLORATE OF POTASSIUM.
KClO₃.

Materia Medica.

Dose. 10 to 30 grs.

Solubility.

1 in 16 of cold water,

1 „ 8 „ glycerine.

Incompatibles. Charcoal, sulphur, ferrous salts, acids, glycerine.

Preparation. *Trochiscus Potassii Chloratis.*

Contains 3 grs. Pot. Chlor. (U.S.P. contains 4½ grs.)

Pharmacology.

SPECIFIC IN ULCERATIVE STOMATITIS,
ANTISEPTIC.

It presumably acts by liberating nascent oxygen, which is an antiseptic and a tissue stimulant.

Therapeutics.

Chlorate of potash used as a gargle, 10 grs. to 1 oz., or as the *lozenge*, causes rapid healing in cases of ulcerative stomatitis. It may also be given internally in 10 gr. doses for an adult, and for children the rule is to give one grain for each year of age up to six. Chlorate of potash is excreted unchanged from the salivary glands and mucous membrane, and is thus again very useful locally.

Rx.

Potassii Chloratis ̄ ij.

Aquae Rosae ̄ vj.

Misce. Fiat collutorium.

Signa. The concentrated mouth-wash.

To be diluted with an equal amount of water and used frequently.

R.

Potassii Chloratis $\bar{5}$ j.
Syrupi Aurantii $\bar{3}$ j.
Aquam ad $\bar{5}$ vj.

Misce. Fiat mistura.

Signa. The mixture.

Two tablespoonfuls to be taken three times a day
 after meals.

Toxicology.

1½ oz. have killed a man.

Symptoms of poisoning.

Pain in the stomach and bowels, vomiting ; collapse,
 jaundice, hæmaturia, suppression of urine.

Treatment.

Wash out the stomach.

Sodii Biboras. BIBORATE OF SODIUM.
 $\text{Na}_2\text{B}_4\text{O}_7, 10\text{H}_2\text{O}.$

Materia Medica.

Synonym. Borax.

Dose. 5 to 20 grs.

Solubility.

1 in 25 of cold water,

1 „ 1 „ glycerine.

Insoluble in alcohol.

Preparations.

Glycerinum Boracis. 1 to 6½.

Mel Boracis.

2 parts Borax ; 1 part Glycerine ; 16 parts Honey.

Pharmacology.

ANTISEPTIC, SPECIFIC FOR APHTHOUS
STOMATITIS.

Therapeutics.

The *glycerinum boracis*, applied on a piece of lint wrapped round the nurse's finger, is a very efficacious means of cleansing the mouth in cases of **aphthous stomatitis** and **thrush** in infants. It is a better preparation than the *mel boracis*, as the glycerine is less liable to undergo fermentation than the honey. It is antiseptic and non-irritant, and the sweet taste of the glycerine renders it very palatable to children.

Potassii Iodidum. POTASSIUM IODIDE. KI.

Materia Medica.

Dose. 5 to 20 grs.

Solubility.

1 in 1 of water,
1 „ 10 „ alcohol,
1 „ 3 „ glycerine.

Pharmacology.

ACCELERATES TISSUE CHANGES, RENDERS THE
BLOOD MORE COAGULABLE; SPECIFIC IN
TERTIARY SYPHILIS.

ALTERATIVE. In syphilis it acts by causing the rapid resolution of gummatous collections, by liberating iodine, which stimulates cells and favours absorption of exudation and inflammatory products.

Therapeutics.

Chiefly as a specific in the tertiary stages of **syphilis**, either alone or in combination with mercury or arsenic.

Potassium iodide has a remarkable power of causing absorption of syphilitic neoplasms; it has recently been determined that iodine and the iodides have a direct action on the micro-organism of syphilis, though not so powerful a one as mercury and arsenic.

Potassium iodide is also given for its effect in removing metallic poisons from the tissues, such as mercury and lead; this is effected by the iodide forming a soluble compound with the metal, which is then readily excreted.

It is very useful in the treatment of chronic inflammations, when its stimulant and alterative properties are made use of.

Potassium iodide should always be given well diluted.

Toxicology.

Symptoms of poisoning. (Iodism.)

Headache, hot skin, dryness and irritation of the throat.

Discharge from eyes and nostrils, rash.

Occasional purging and vomiting.

Treatment.

Increase a small dose; or substitute the sodium or ammonium salt.

Hydrargyrum. See also pp. 67 and 147.

Preparations.

Hydrargyrum cum Creta. Grey Powder. 1 in 3.

Dose. 1 to 5 grs.

Pilula Hydrargyri. Blue Pill. 1 in 3.

Dose. 4 to 8 grs.

"Grey Oil," Lambkin's formula. (Not official.)

Mercury 1 oz.

Anhydrous lanoline 4 oz. (by weight).

Liquid paraffin (carbolised to 2%) to 10 oz.
(by volume).

Hydrargyri Subchloridum. Calomel. See p. 147.

"Calomel Cream," Lambkin's formula. (Not official.)

Calomel 1 grain.

Fatty basis (principally Palmitin) 10 m.
(for each injection).

Hydrargyri Perchloridum. Corrosive Sublimate
See p. 67.

Liquor Hydrargyri Perchloridi. 1 in 876.
Dose. $\frac{1}{2}$ to 1 dr.

Hydrargyri Iodidum Rubrum. HgI_2 .
Dose. $\frac{1}{32}$ to $\frac{1}{8}$ gr.

Liquor Arsenii et Hydrargyri Iodidi.
(Donovan's Solution.)

Contains 1% of each iodide.

Dose. 10 to 30 mins.

Hydrargyri Iodidum Viride. (Not official.)

Dose. $\frac{1}{2}$ to 2 grs.

Pharmacology.

ANTISEPTIC, DISINFECTANT, PURGATIVE;
SPECIFIC FOR SYPHILIS.

Mercurial preparations, administered by any of the methods afterwards to be described, are more or less rapidly absorbed into the system. According to some observers, mercury circulates in the serum as a chlor-albuminate: according to others, in the leucocytes, as reduced mercury in a state of fine division. Mercury is partly excreted in the urine, etc., at once; partly retained in the tissues, to be slowly excreted later. It is this retained portion that when in excess produces symptoms of "mercurialisation." Mercurials appear to have a very definite effect upon the *Spirochaeta pallida*, the micro-organism which is the infective agent in syphilis. Under mercurial treatment the spirochaetac found in the tissues have been noted to quickly diminish in numbers and eventually disappear.

Therapeutics.

As a SPECIFIC mercury is given during the primary and secondary stages of syphilis, and must be regularly administered for a definite period, which may vary from one to three years. It is of the greatest value either alone or combined with arsenic preparations. (See p. 174.)

During the administration of mercury it is necessary to keep the mouth very clean, for the mercury is excreted largely by the mucous membrane of the mouth, during which process it sets up irritation; if sepsis is added to this, the gums become inflamed (spongy gums).

Mercury for the cure of syphilis may be given—

(1) By the mouth. This was the commonest method on account of its convenience, though open to the objection that the drug frequently caused gastric or intestinal disturbances. Blue pill, mercury and chalk, the green iodide (not official), or perchloride in mixture with ammonia, were all favourite preparations.

(2) By inunction. 1 to 4 drachms of mercurial ointment are thoroughly rubbed into the skin at night, and not washed off until the next morning. This method is especially useful with infants.

(3) By injection, intra-venous or intra-muscular. In the former method injection of a soluble preparation, such as the cyanide or biniodide, is made directly into a vein. The drug is necessarily rapidly absorbed, but rapidly excreted. The attendant risks are those of periphlebitis and embolism. Intra-muscular injection has been largely practised, and has proved especially useful in military surgery. The muscles of the buttock are usually selected as the site of injection. Soluble preparations, such as the biniodide, perchloride, sal alcmbroth, succinamide, soziodolate, may be employed where a rapid effect is desired; but insoluble preparations, such as "grey oil," calomel, and salicylate, are more slowly absorbed, and less readily excreted, thus necessitating less frequent injection, and have been found to give better results. "Grey oil" is given in doses of 3 c.cm. weekly or 1 c.grm. (= .5 c.cm.) daily. The disadvantages of the injection method is the pain caused, the occasional formation of local nodules, abscess, or of embolism.

(4) By fumigation. By exposing the patient's body to the fumes of vaporised calomel. This is an uncertain method, and liable to cause profuse salivation.

Besides the acute toxic effects mentioned on page 69, mercurials administered in any of the above-mentioned ways may cause stomatitis, gastro enteritis, cutaneous eruptions, and general disorders of nutrition.

Prophylactic use of mercury.

The previous inunction of an ointment consisting of 20 parts of calomel to 20 of lanoline has prevented the success of experimental inoculation of syphilitic virus in man. Roux and Metchnikoff have recommended the use of an ointment composed of calomel 1 part with lanoline 3 parts as a prophylactic ointment for use by surgeons and nurses who have to deal with cases of syphilis and are consequently liable to infection.

Arsenic. See also pp. 14 and 155.

CAUSTIC, ANTISEPTIC, TONIC, ANTISYPHILITIC.

ANTISYPHILITIC. Since the last edition of these "Notes" arsenic has come into considerable prominence as an antisyphilitic remedy. Arsenic has long been employed empirically in the treatment of syphilitic skin diseases, usually in conjunction with mercury, just as it was used empirically in malarial conditions.

Malaria and syphilis are now both proved to be parasitic diseases, the former due to the presence in the blood corpuscles of a trypanosome (*Plasmodium malariae*), the latter to the presence in the tissues of the body of a variety of spirillum (*Spirochaeta pallida*).

To both these organisms arsenic acts as a poison.

The treatment of general infections by "chemotherapy," or introduction into the system of chemical substances, appears to be especially called for in

diseases (such as syphilis) in which there is no development of antitoxic substances to combat the infection, or where these antitoxins cannot be prepared and introduced from without (serum-therapy, see p. 157).

The ideal aimed at is the "Therapia Sterilans Magna," or killing off all the parasites by a single dose of a drug, as opposed to the older method of gradual dosage; this, however, while applicable to animals, has not yet proved practical in the case of man.

Before introducing chemicals into the body with the idea of their acting as disinfectants, two points have to be taken into consideration:

A. What dose will be sufficient to kill all the parasites?

B. What is the maximum dose that can be tolerated with impunity by the organism?

Thus a drug with a powerful may on the whole be less useful than a drug with a weak parasiticide action, on account of the less toxic action of the latter.

The "dose ratio" has been calculated by dividing the A by the B, and according to Erlich the resultant should never exceed $\frac{1}{3}$.

Inorganic arsenic preparations cannot be administered in large doses for any length of time, as the arsenic is but slowly eliminated and remains stored up in the body, giving rise to toxic symptoms (see also p. 18).

It has been found, however, that organic arsenic compounds—*i.e.*, those in which the arsenic is in direct chemical combination with a carbon atom—are much less poisonous in their effects; and, further, that when the arsenic is present in the molecule in the trivalent (unsaturated) form it is much more active upon organisms.

Organic arsenic compounds have therefore been employed usefully in many diseases characterised by the presence in the blood or tissues of spirilla (spirochælosis) or trypanosomes (trypanosomiasis).

These organic arsenic compounds are either fatty (aliphatic) derivatives, or benzol derivatives.

Of the former, cacodylic acid and its compounds (especially sodium cacodylate), and of the latter arsanilic acid (or atoxyl) have been employed of late years in the treatment of such infective diseases as syphilis, malaria and tubercle, with considerable success; but their usefulness has been limited by the considerable risks attending their administration, among which may be mentioned the very serious one of producing atrophic changes in the optic nerve leading to blindness.

Dioxy - diamino - arseno - benzol - dihydrochloride, arseno-benzol, Erlich-Hata, "606," or Salvarsan, a drug introduced by Professor Erlich, appears to be at once more potent and less toxic than the other arsenic benzol derivatives. According to one authority, Salvarsan owes its low toxicity to its comparative insolubility in the blood. It is excreted more slowly than atoxyl, and has not the serious effect upon the optic nerve of this substance, one observer reporting 25,000 injections without damage to the optic apparatus. Salvarsan is a bright yellow powder containing 34% of arsenic, and soluble about 1 in 5 of water and 1 in 3 of alcohol. It is fairly stable in the form of the dihydrochloride, but before use must be converted into the unstable mono- or bi-sodium salt by the addition of sodium hydrate and then neutralised; solutions must therefore be freshly prepared. It is administered by intra-venous, intra-muscular, or, less frequently, subcutaneous injection, a dose of 1 to 1.4 grm. being employed, divided into two or three doses over a period of some days. At least one of these injections should be intra-venous, which may be followed by intra-muscular injections. Intra-venous and subcutaneous injections act more quickly and the arsenic is more rapidly excreted, but this is not always an advantage.

Salvarsan has been employed with success in many infective diseases, among which may be especially

mentioned relapsing fever, plague, malaria, and framboesia ; the chief interest, however, that centres round it is as a specific for syphilis, as it has the advantage over mercury of a more rapid effect, and may be employed in all stages of the disease.

Under its influence primary syphilitic sores disappear in a few days ; macular plaques, roseola, iritis, and other secondary symptoms rapidly resolve ; and it has a markedly beneficial effect upon gummata periostitis and visceral and nervous tertiary syphilis.

It has been used in the treatment of congenital syphilis, and in cases of malignant syphilis where the administration of mercury and iodides produced no effect, but para-syphilitic conditions, such as general paralysis and tabes, have not proved amenable to the remedy.

Salvarsan is now commonly used in conjunction with mercurial treatment for syphilis, though simultaneous use of the two drugs causes delay in the elimination of the arsenic.

Many recurrences and relapses of the disease after treatment by Salvarsan have been reported ; this is probably because certain encapsuled foci of infection are not accessible to the remedy, and Professor Erlich does not make the claim that it is at present a perfect "cure" for syphilis. Administration of Salvarsan cannot be considered as entirely free from risk, as necrosis of the gluteal muscles following intra-muscular injection, acute nephritis, and toxic symptoms from arsenic retention have been known to occur, leading in more than one case to a fatal result.

It is contra-indicated in cases of great exhaustion of vitality, kidney disease, diabetes, and many other general diseases.

Limonis Succus. LEMON JUICE.

Materia Medica.

Source. The freshly expressed juice of *Citrus medica*.

Pharmacology.

RELIEVES THIRST; SPECIFIC FOR SCURVY.

Therapeutics.

Lemon juice is used in the preparation of drinks for the relief of thirst during fever. Lime juice (a similar juice) is employed as a preventive agent and a remedy for **scurvy**. For this purpose it is always carried on ships, where fresh food is not procurable. It acts by supplying the vegetable acids and salts which are wanting in dried and preserved food.

ANALGESICS. Antineuralgic Drugs, Antiperiodics.

Analgesics (*ἄν* without, *ἄλγος* pain), strictly speaking, include all medicines which have an anodyne effect, local or general. The term may be advantageously limited to those drugs which, administered internally, relieve pain without producing a narcotic effect or a general anæsthesia.

Antiperiodics are remedies employed to arrest the return of diseases which recur periodically.

Example.—Quinine in malarial fever.

Hence those drugs employed to check those forms of neuralgia which manifest periodicity are included.

When a patient suffering pain seeks the aid of the dentist, the pain is practically always connected with one or more of the branches of the fifth nerve. The pain may or may not be due to dental trouble. In the former case, by suitable treatment, "*secundum artem*," the dentist can usually at once give relief and ultimately effect a cure by removal of the cause. If the latter, and no cause coming within the dentist's province can be discovered, the patient is, as a rule, best referred to the care of a medical man, as it must be borne in mind that neuralgia may be due to very varied morbid conditions, some of them of the gravest possible nature.

Example.—Pressure on nerve trunks by a malignant tumour.

The exact cause of neuralgic pain, even when dependent on dental disease, is sometimes obscure. The dental practitioner therefore should be acquainted with the action of the remedies which may give relief pending accurate diagnosis, and with the general therapeutic principles involved.

Drugs used to relieve or cure neuralgic pain (the term neuralgia being used in its broadest possible significance, as it is impossible here to enter into the pathology of the subject) are of use applied locally or given internally.

For local sedatives and local anodynes, which are often of much use, especially where actual neuritis or inflammation of nerve trunks and branches is present, see p. 98 *et seq.*

Analgesic drugs for internal administration may be divided into :—

1. Medicines which cure neuralgic pains by removing the cause.

Example.—Quinine or arsenic in neuralgia of malarial origin.

Quinine and arsenic were formerly employed empirically in malaria; they are now known to have an effect upon the plasmodium or malarial parasite.

2. Medicines which improve nutrition and the general health.

In many cases of neuralgia the patient will be found badly nourished and debilitated, this being a predisposing if not an actual cause of the nervous trouble; here a tonic plan of treatment is indicated. See p. 149 *et seq.*

Certain tonic remedies appear to be particularly efficacious in curing neuralgia, notably arsenic and cod-liver oil.

3. Remedies which exert a “specific” action.

Example. — Butyl - chloral hydrate has been credited with a specific action in trigeminal neuralgia.

4. Drugs which are of value in relieving pain temporarily (sedatives, narcotics). These may be divided into

(a) General cerebral sedatives. See p. 190.

These must be very sparingly used, both on account

of their general depressant action and the readiness with which a habit of taking them is acquired.

- (b) Drugs having a depressant effect on certain sensory centres, but which do not otherwise influence cerebral activity.

Example.—The coal-tar derivatives; gelsemium.

These are of much value in affording relief in cases of neuralgic pain, though it must be remembered that they, too, have a dangerously depressant effect if given too freely.

In connection with class 4, remember that it is therapeutically wrong to treat symptoms when a removable cause is present.

Coal-Tar Derivatives.

Phenazonum. PHENAZONE.

Materia Medica.

Synonym. Antipyrin.

Dose. 5 to 20 grs.

Solubility.

Freely in water, alcohol, chloroform.

Incompatibles.

Iron salts; all preparations containing tannin; chloral hydrate, except in very dilute solutions; spirit of nitrous ether; cinchona alkaloids; hydrocyanic and nitric acids; and other drugs, with which, however, it is not likely to be prescribed in combination.

Acetanilidum. ACETANILIDE.**Materia Medica.**

Synonyms. Antifebrin, Phenylacetamide.

Dose. 1 to 3 grs.

Solubility.

1 in 200 of cold water (1 in 18 boiling),

1 „ 4 „ alcohol,

Freely in chloroform and ether.

Phenacetinum. PHENACETINE.**Materia Medica.**

Dose. 5 to 10 grs. (suspended).

Solubility.

Very sparingly in water (1 in 1700),
1 in 20 of alcohol.

Pharmacology.

These drugs are powerful ANTIPYRETICS, ANALGESICS, and all DEPRESS THE HEART'S ACTION. Acetanilide and phenazone applied locally contract blood-vessels, and so have some local HÆMOSTATIC action.

ANALGESIC. The value of these drugs as analgesics appears to be due to a depressant effect upon the cerebral nerve centres. Their action is not comparable to that of the true narcotics, for it occurs as the result of doses that do not apparently influence mental activity, nor cause somnolence nor appreciable depression.

Therapeutics.

To the dentist they are of service in neuralgic affections of the fifth nerve, of which the cause is obscure, though a dental origin of the trouble is suspected; as in cases of irritation caused by exostosis, pulp nodules, or the application of arsenic.

It must be carefully borne in mind, however, that these drugs are merely of service in relieving symptoms (usually temporary in their action in this respect), and not true remedies. Also that in large doses, or moderate doses frequently repeated, they are liable to produce toxic symptoms, from their cardiac depressant action; and patients must be cautioned against indiscriminate self-dosing, a habit unfortunately popular.

Acetanilide is that most likely to produce toxic symptoms, phenacetin the least so. Phenazone is the most certain analgesic, acetanilide the least. On the whole, *phenacetin* is the drug to be preferred, and may be given in 5 gr. doses every three hours till relief is obtained. Owing to its insolubility in water (and the same applies to acetanilide), it is best prescribed in the form of powders, to be taken in a "cachet" or stirred up with water and drunk quickly.

Rx.

Phenacetini. gr. v.

Mitte doses iii, forma pulveris.

Signa. One to be taken every hour till relief is obtained.

Or the drug may be suspended in *mucilage of tragacanth*.

Phenazone may be prescribed in solution, remembering to avoid combining it with incompatibles.

"Antikamnia" and Ammonol, proprietary drugs, contain *acetanilide*, the former as much as 70%.

Toxicology.

Acetanilide. Death has resulted from two headache powders, containing between 4 and 10 grs. of acetanilide in each. Toxic effects have been observed as the effect of two 4 gr. doses quickly repeated; and a single dose of 5 gr. in an adult and 2 gr. in a child. Acetanilide has caused poisoning by external application.

Phenazone. Toxic effects have occurred after 10 grs. In Vienna 17 persons were killed by overdosing with phenazone during an epidemic of influenza; 3 gr. of phenazone have proved poisonous to a child.

Phenacetin. Poisonous symptoms have resulted from three doses of 8 grs., and a single dose of 10 grs. Fewest deaths have resulted from phenacetin poisoning, and most from acetanilide, but the total number recorded is by no means inconsiderable.

Symptoms of poisoning.

Fainting, collapse.

Slow respiration, irregular pulse, cyanosis.

Vomiting, sweating, profound prostration.

Death from cardiac paralysis.

Any of these drugs may produce a rash resembling that of measles or scarlet fever.

Treatment.

Stimulants (alcohol, strong coffee, the latter administered per rectum if there is vomiting).

Ether, 30 min., injected subcutaneously.

Liq. Strychninae Hydrochloridi m. iii, subcutaneously.

Warmth and friction.

Acidum Salicylicum. See p. 91.**Materia Medica.***Preparation.*

Sodii Salicylas, Salicylate of Sodium. $\text{NaC}_7\text{H}_5\text{O}_3$.

Dose. 10 to 30 grs.

Solubility.

1 in 1 of water,
1 „ 6 „, alcohol.

Incompatible with hydrobromic acid, ammonia preparations, iron salts.

Acetyl-salicylic Acid (Aspirin). Not official.

Dose. 5 to 10 grs.

Solubility.

Sparingly in water,
Readily in alcohol.

Pharmacology and Therapeutics.

ANTIPYRETIC, ANTIPERIODIC; ANALGESIC; SPECIFIC IN ACUTE RHEUMATISM. Salicylic acid is a powerful antiseptic and irritant. From their specific action in acute rheumatic affections, salicylates are of value in neuralgic pain of rheumatic origin, as in cases of neuritis due to cold. Salicylic preparations, especially aspirin, appear to possess definite analgesic properties somewhat similar to the coal-tar derivatives (see page 181), and may be used for the same purposes. From the fact that they increase the nitrogenous elimination, especially that of uric acid, salicylates are sometimes serviceable in chronic rheumatic and gouty conditions, so may be given for neuralgia dependent on dental exostosis, for which these causes exist.

The salicylic ion is anionic.

Gelsemii Radix. YELLOW JASMINE ROOT.**Materia Medica.***Source.*

The dried rhizome and rootlets of *Gelsemium nitidum*.

Composition.

Contains alkaloids, gelsemine and gelseminine.

Preparations.

Tinctura Gelsemii. 1 in 10 of alcohol 60%.

Dose. 5 to 15 mins.

Gelsemini Hydrochloridum. Not official.

Dose. $\frac{1}{200}$ to $\frac{1}{20}$ gr.

Pharmacology.

ANALGESIC, FEBRIFUGE (p).

ANALGESIC. *Gelsemium* is a powerful depressant of the central nervous system, especially of the anterior cornua of the cord, and in poisonous doses causes muscular paralysis. The sensory centres are also depressed, though to a less extent, and to this later action the analgesic properties of the drug are probably due. As in the case of the coal-tar derivatives, the higher cerebral centres are unaffected, and no narcotic effects result.

Therapeutics.

Jasmine is not a drug to be often prescribed, owing to uncertain action and poisonous properties. A fairly safe method of administration is to give 10 mins. of the *tincture* every six hours until relief is obtained. Gelsemine may be combined

with other remedies, such as quinine or butyl-chloral hydrate, in the form of a pill.

R.

Gelsemini Hydrochloridi. gr. $\frac{1}{200}$.

Butyl-chloral Hydratis. gr. *ijj*.

Misce et tere. Fiat pilula. Mitte *ijj*.

Signa. One to be taken every three hours till pain is relieved.

Toxicology.

Poisonous symptoms (paralysis of muscles) from taking 10 mins. of tincture every three hours during one day and about 80 mins. during the night.

Symptoms of poisoning:

Disordered vision ; diplopia ; dilated pupils.

Weak pulse ; slow respiration.

Unsteady gait ; paralysis of muscles.

Asphyxia.

Treatment.

Wash out stomach if seen early enough.

Stimulants.

Liquor Strychninae m. *iii.*, subcutaneously.

Artificial respiration.

Butyl-Chloral Hydras. BUTYL-CHLORAL HYDRATE.

Materia Medica.

Synonym. Croton chloral.

Dose. 15 to 40 grs.

Solubility. 1 in 50 of water,
Freely in spirit and glycerine.

Pharmacology and Therapeutics.

HYPNOTIC, SPECIFIC IN NEURALGIA OF FIFTH NERVE, CARDIAC DEPRESSANT.

ANALGESIC. The pharmacological action of butyl-chloral is the same as that of chloral hydrate. See p. 193. The drug has been credited with a specific action on the nerves of the face and head, though the most recent view is that its action is identical with chloral in all respects, except that it is less certain in its effects. May be prescribed as follows :—

Rx.

Butyl-Chloral Hydratis. gr. iij.

Glycerini Tragacanthae. q.s.

Misce et tere. Fiat pilula. Mitte iij.

Signa. One every two hours till pain is relieved.

Toxicology. As for chloral hydrate. See p. 194.

Quininae Sulphas. SULPHATE OF QUININE.**Materia Medica.***Dose.*

1 to 5 grs. as bitter.

2 to 20 grs. as antipyretic and antiperiodic.

Source.

An alkaloid prepared from Cinchona bark.

Solubility.

With difficulty in water (1 in 800).

Easily in acidulated water.

1 in 65 of alcohol.

Incompatibles.

Alkalics ; astringent infusions.

Pharmacology and Therapeutics.**ANTISEPTIC, BITTER STOMACHIC TONIC,
ANTIPIRETIC, ANTIPERIODIC.**

ANTIPERIODIC. Quinine while circulating in the blood is a direct poison to the organisms which are the cause of malarial fever (ague), and will both act as a prophylactic and, if the use be continued, as a cure for the disease. For paroxysmal neuralgia, which follows malaria, quinine is frequently an efficacious remedy, and may also benefit neuralgia which is not malarial in origin, though how it acts in the latter case is not clearly understood.

BITTER STOMACHIC TONIC. From its properties as a stomachic bitter it is frequently prescribed as a tonic remedy (see p. 154), and by improvement of the general health may be serviceable in the neuralgia of debility.

Note.—In prescribing sulphate of quinine, 1 minim of a dilute mineral acid should be added to the mixture for every grain of the alkaloid, that the latter may be kept in solution.

GENERAL SEDATIVES OF THE NERVOUS SYSTEM.

Anodynes, Hypnotics.

General Anodynes (*ἄν*, without, *ὀδύνη*, pain) are drugs which, from their action on the nervous system, are employed for the relief of pain. They may be conveniently divided into —

1. NARCOTICS. Medicines which, in addition to their anodyne action, produce sleep and other symptoms of nervous depression.

General anæsthetics (see p. 195) must, strictly speaking, be included in this category.

2. ANALGESICS. See p. 179 *et seq.*

Hypnotics (*ὑπνος*, sleep) are drugs which induce sleep, with or without an additional anodyne effect.

Medicines which possess a purely hypnotic action have but little interest for the dentist, as they are chiefly employed in conditions which fall outside the scope of dental practice. They are sometimes, however, employed in combination with true anodynes.

Morbid conditions, involving severe pain, come frequently under the dental surgeon's notice, and narcotic drugs are frequently employed, legitimately and otherwise, in the symptomatic treatment of painful affections. A brief description, therefore, of the action and uses of a few of the more important

sedatives is appended. It must be strongly urged, however, that they should never be prescribed except by a qualified medical man. Apart from certain other risks attending their use, there is that of the patient acquiring "drug habits" difficult to eradicate and disastrous in results.

Opium.

Pharmacology. LOCAL ANODYNE (doubtful, see p. 111); DIMINISHES SECRETION, CHECKS INTES-TINAL PERISTALSIS. To the nervous system STIMULANT (at first); ANODYNE, HYPNOTIC, NARCOTIC; DEPRESSANT TO AFFERENT nerves; DIAPHORETIC; SPECIFIC IN GLYCOSURIA.

SEDATIVE. In moderate doses, the first effect of opium upon the nervous system is one of stimulation of the higher cerebral faculties; there is increase of mental power and a sense of general exaltation, happiness, and well-being, attended, however, in most cases by slight inco-ordination, perversion, and extravagance of imagination. Depression soon supervenes, and the perceptive centres of the brain become depressed, so that pain and other impressions on the sensory nerves are no longer felt. At the same time the drug exerts a HYPNOTIC action, and the patient becomes drowsy and sleeps.

If the dose be excessive, the stimulative stage is absent, and the cerebrum is profoundly depressed, and a comatose condition supervenes. The motor centres in the spinal cord are depressed by opium after a brief preliminary stimulation, and reflex movement is difficult to obtain.

The depression extends to the medullary centres, death by poisoning with opium being due to paralysis of the respiratory centre.

The afferent (including the sensory) NERVES of all organs of the body are DEPRESSED. The

sedative effects of opium on the nervous system are due to the presence of its principal alkaloid, *morphine*. The latter acts more quickly and certainly than opium, is better suited for subcutaneous injection, and less likely to derange digestion or cause constipation.

*mecum
acid.*

Therapeutics.

A complete description of uses is impossible here, and a larger work must be consulted. Speaking generally, opium is employed to relieve pain and induce sleep. Its quieting action on the heart and nervous system is at times useful in cases of prolonged hæmorrhage. In prescribing it the following points have to be remembered—

1. That many persons, from idiosyncrasy, are unduly susceptible or resistant to its action. Children are extremely susceptible to the action of quite small doses, hence the dangerous nature of many teething powders which contain the drug. Persons who are accustomed to the habitual use of opium or morphine will often bear an enormous dose without effect, and large doses are tolerated in many diseased conditions attended by severe pain.

2. It is contra-indicated (because dangerous), or to be employed with great caution in certain diseases, notably respiratory and renal affections.

Toxicology.

4 grains of *opium* and 2 drachms of *tincture of opium* have respectively proved fatal.

1 grain of *hydrochlorate of morphine* has caused death; and as a hypodermic injection, or in certain diseases, a smaller quantity might well prove fatal.

Symptoms of poisoning.

Drowsiness, sleep, coma.
Contraction of the pupils ("pin-point pupils").
Abolition of reflex action.
Coldness of skin, lividity.
Pulse weak and slow.
Respiration slow and irregular, finally stertorous.

Treatment.

Wash out stomach with a solution of **permanganate of potash** (which decomposes morphine), 1 in 400, leaving a few ounces in the stomach.

Rouse patient, and keep him walking about if possible.

Stimulate by flicking, irritation, faradic current, ammonia to nostrils.

Strong coffee; *ether* hypodermically, 5 mins.

Give $\frac{1}{20}$ gr. **atropine sulphate** subcutaneously every half-hour (atropine being the physiological antidote to morphine).

If respiration be failing, artificial respiration and oxygen inhalations.

Keep treatment up for several hours if necessary.

Chloral Hydras. CHLORAL HYDRATE.

Pharmacology and Therapeutics.

ANTISEPTIC, LOCAL ANODYNE, HYPNOTIC.
DEPRESSANT OF HEART.

SEDATIVE. Chloral is a powerful HYPNOTIC, acting directly on the cerebrum. The sleep produced by this drug is of a natural character, and there are no unpleasant after-effects. It does not, however, relieve pain, save in dangerously large doses, though it may be useful combined with other anodyne medicines. Chloral is a powerful general depressant, and

in excessive doses affects the respiratory and vaso-motor centres, the anterior cornua of the cord, and the heart.

The habit of chloral taking is unfortunately common; it leads to general weakness, gastric derangement, cardiac and respiratory depression, and insanity.

Toxicology.

Eighty grains have proved fatal.

Symptoms of poisoning.

Coldness; lividity; weak, irregular, feeble pulse.
Coma and abolition of reflex movements.

Treatment.

Wash out stomach, or give emetics.
Stimulants as in opium poisoning (see above).
Warmth, friction, massage.
3 mins. of *liquor strychninae* subcutaneously.

Bromides of Potassium, Sodium, and Ammonium.

Pharmacology and Therapeutics.

SEDATIVES to the nervous system generally;
powerful HYPNOTICS, DEPRESSANT TO HEART'S
ACTION.

SEDATIVE. In addition to sedative action on the cerebral centres, bromides reduce the reflex excitability of the spinal cord. The peripheral (including the sensory) nerves are also depressed, and activity of the muscles diminished. Bromides are of some interest to the dentist, as they are occasionally employed for their sedative properties in the treatment of neuralgic affections, and in infantile convulsions due to teething.

They have been given, as physiologically antagonistic, in cases of strychnine poisoning.

GENERAL ANÆSTHETICS.

General Anæsthetics are drugs that reduce or remove consciousness, and with it the perception of pain. Drugs of this class owe their anæsthetic properties to their action in temporarily arresting the functions of the cerebral convolutions. On the nervous system in general their action is—

FIRSTLY, Stimulant; this stage varying in length with the different anæsthetics. Stimulation of the highest centres occurs first.

SECONDLY, Depressant; depression, like stimulation, occurring first in the higher cerebral centres, and only after this affecting the important functions of the medulla and cord.

General anæsthetics are given to cause unconsciousness and freedom from pain during surgical operations; to relax muscles during reduction of dislocations, etc.; sometimes to relieve severe pain, as in parturition; and to check convulsions in tetanus and strychnine poisoning.

To the dentist they are of use—

(1) During the extraction of teeth and during small operations in the mouth.

(2) To relax the muscles of the jaw in reducing dislocation, and securing adaptation of the fragments after fracture.

(3) In cases of trismus due to dental causes, to allow of the mouth being forcibly opened, and of proper examination and treatment.

General anæsthetics are practically always administered by inhalation; though ether has been given per rectum with some success, and per bronchi.

Dangers of General Anæsthetics.

No general anæsthetic drug can be considered as absolutely safe, though with ordinary care and sufficient experience on the part of the administrator, risk is reduced to a minimum. In no case should the anæsthetic be given and operation performed by the same individual, as an anæsthetised patient must always be regarded as in a critical state, requiring the individual attention of some other skilled person than the operator.

The chief dangers are :—

1. Death from shock.

This usually occurs *before* the patient is fully under the influence of the anæsthetic, and takes place from the reflex stoppage of the heart, owing to the stimulus of a premature commencement of the operation, an accident especially liable to happen in chloroform administration.

2. Failure of respiration.

Causes.

(a) Overdose of anæsthetic drug.

(b) Interference with freedom of respiratory movements, from position of patient, tight clothing, pulmonary disease.

(c) Interference with main air passage, as from slipping back of tongue; or passage into the trachea of vomited matter, blood, or foreign bodies, such as a tooth or piece of broken forceps.

Symptoms.

Lividity, forced inspiration, weak or slow respiration, stridor.

Treatment.

Recumbent posture, throw back head, pull tongue forward, clear air passages (laryngotomy), if necessary, loosen clothes, artificial respiration.

In case of a loose body escaping to the back of the mouth, the head should at once be brought forwards with the face downwards.

3. Cardiac failure.*Causes.*

Overdose of anæsthetic drug ; vapour too concentrated.

Symptoms.

Pallor, feebleness, irregularity or disappearance of radial pulse.

Treatment.

Raise feet, lower head ; artificial respiration.

Stimulate heart directly by flicking chest with wet towel, or, better, application of faradic current if available.

Inject subcutaneously **3** minims of *liquor strychninae* in a syringe of *brandy*.

Inhalation of *amyl-nitrite*.

Cardiac failure occasionally occurs in the early stages of anæsthesia, before commencement of the operation, and in these cases can hardly be ascribed to shock.

In all cases before administration of a general anæsthetic it is advisable to empty the rectum and bladder. Before a prolonged anæsthesia a purgative or enema should be administered as a routine practice (see p. 143), and no food should be taken some hours previously. Should vomiting occur, the patient should be placed on his side in the recumbent posture.

Choice of an Anæsthetic for Dental Operations.

For all operations which can be completed under one minute, nitrous oxide gas is to be preferred, as it

is practically free from risk, not unpleasant to take, and free from after-effects.

For operations lasting up to five minutes gas administered continuously may be employed.

For longer operations ether narcosis, which may, if desired, be preceded by administration of gas, should be preferred, its greater safety compensating for other disadvantages. Chloroform should not be given.

A local anæsthetic (see p. 98 *et seq.*) may be used instead of a general where efficient and free from danger—

1. Where it will relieve the pain with only minor risks (not risks to life), and a general anæsthetic is not available.

2. In deference to the patient's fears or objection to losing consciousness.

3. In the absence of an experienced and qualified person to administer the anæsthetic.

4. When a prolonged effect is desired, and a local anæsthetic will be efficient and less dangerous and troublesome than ether.

No dentist has any right to take a risk (which is not truly his, but the patient's) without fully explaining the risk to the patient and his friends beforehand.

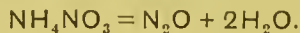
Nitrous Oxide Gas. N_2O . Not official.

Materia Medica.

Synonym. Laughing gas.

Source.

Prepared by heating ammonium nitrate in a retort, and collecting the gas which results, after purifying by passing through distilled water and solutions of ferrous sulphate and caustic potash.



Pharmacology.

On being breathed the gas passes into the capillary vessels of the lungs and so to the circulation generally.

In the blood it reduces the oxygen in combination with the hæmoglobin of the red cells, and itself forms an unstable combination with this substance. The nervous system soon comes under its influence. There is a brief stimulation of the cerebrum, shown chiefly by the subjective symptoms (extravagant ideation, hilarity), quickly followed by depression, which leads to loss of consciousness. Motor phenomena (struggling, etc.) are frequently absent, and if present are much less marked than with other general anæsthetics. If the administration be continued, the other parts of the central nervous system become depressed, and death occurs from paralysis of the respiratory centre in the medulla, or from exclusion of oxygen. It is now generally held that nitrous oxide gas has a TRUE ANÆSTHETIC effect, and that its action is not solely due to causation of a condition of asphyxia, or deprivation of oxygen to the nervous tissues. That some degree of asphyxia results is shown by the occurrence of cyanosis in the deeper stages of anæsthesia. This is, however, entirely prevented by the admixture of oxygen with the nitrous oxide gas, a method now frequently adopted.

The heart's beat is increased in force and rapidity until deep anæsthesia is reached, when it becomes slower. If the administration is continued, it becomes more and more feeble, and finally ceases, but always after respiration has ceased for some little time. In other words, a fatal dose of gas paralyzes the respiratory centre before the cardiac. Hence the value of artificial respiration as a resuscitating measure should an overdose have been given.

The respirations are at first quickened and increased in depth, then gradually shallower, finally stertorous.

Blood-pressure rises, and the cerebral blood-vessels become markedly distended.

A few cases of hemiplegia have been noted after nitrous oxide administration, but this accident appears to be very rare.

In the deeper stages of anaesthesia, twitchings, jactitation or irregular contractions of the voluntary muscles commonly occur.

The clinical signs of complete anaesthesia are—

1. Abolition of the pupillary light reflex (early).
2. Slow and stertorous respiration.
3. Pallor or slight bluish tinge of the face.
4. Muscular twitchings.

Where oxygen is given with the gas, the first sign is the only constant one.

Therapeutics.

Nitrous oxide gas may be administered—

1. Pure—that is, with air excluded.
2. Mixed with a small proportion of air.
3. Mixed with oxygen.

It is the safest general anaesthetic we possess; cases of death occurring from its administration being of very great rarity. Hence for short operations, lasting one minute or less, it is to be preferred to all others.

The great objection is the brevity of the duration of the anaesthesia (30 to 60 seconds), and to overcome this objection various forms of apparatus have been introduced to allow of a continuous administration during oral operations. A more prolonged narcosis, up to 10 or 15 minutes, may in suitable cases be obtained in this way, though results seem to vary with different individuals, and “asphyxial” symptoms (cyanosis, etc.) are frequently prominent.

Note.—That retching or vomiting occasionally occurs under gas. Passage of urine sometimes takes place. In female patients delusions of a sexual nature may result.

Hence gas should not be taken on a full stomach; the bladder should be emptied previously; and no female patient should be anaesthetised without the presence of a third person.

Nitrous oxide gas is *contra-indicated* in persons suffering from disease of the blood-vessels (as in chronic Bright's disease), for the rise of blood-pressure and dilatation of the cerebral vessels, mentioned above, may lead to an apoplectic seizure from rupture of one of the latter.

Æther. ETHER. $(C_2H_5)_2O$.

Materia Medica.

Synonym. Sulphuric Ether.

Composition. 92% by volume of ethyl oxide, and 8% ethylic alcohol.

Dose. 10 to 60 mins. (by the mouth).

Preparation. **Spiritus Ætheris.** Ether 1 part and alcohol 2 parts.

Dose. 60 to 90 mins. for a single administration.

Pharmacology.

GENERAL ANÆSTHETIC; LOCAL ANÆSTHETIC (refrigerant); internally CARMINATIVE; CARDIAC STIMULANT.

ANÆSTHETIC. Ether vapour when inhaled is speedily absorbed into the blood from the lungs, and manifests its effects on the nervous system. These effects are commonly divided into three stages, which, however, pass insensibly the one into the other.

1. The stimulation stage, in which are affected—
 - (a) The higher cerebral centres, shown by incoherence of thought, excited imagination, disorders of sight and hearing.

- (b) The lower motor cerebral centres, shown by shouting or talking, throwing limbs about, or struggling.
- (c) The medullary centres, increase of pulse rate, rise of blood-pressure, and respiratory movements.

2. **The stage of depression.** All the cerebral centres affected, consciousness lost, movements of voluntary muscles cease, medullary centres also somewhat depressed, pulse and respiration less frequent and strong, pupils contracted; some reflexes lost—*e.g.*, conjunctival. This is the stage at which to perform surgical operations.

3. **The stage of abolition of all reflex excitability.** Muscles lose their tone, pupils dilated, urine and fæces frequently passed; all nervous centres profoundly depressed.

The drug has occasionally to be pushed to this stage to obtain total muscular relaxation for the reduction of dislocations or exploration of viscera through the abdominal wall.

If more of the drug be given, the depression of the medullary centres continues, the respirations become weak and shallow, the pulse feeble and irregular, blood-pressure gradually falls, and the heart stops finally in diastole.

Therapeutics.

General anæsthetic. Ether is to be preferred to chloroform as a general anæsthetic for prolonged operations, as it has the great advantage of depressing the heart less than the latter drug; and the same is true of the vaso-motor and respiratory centres. It should be avoided, however, in the case of very young or aged patients, in whom the respiratory mucous membrane is likely to be irritated by its vapour, and bronchitis to be set up; also in the case of persons already suffering from this affection. The

following are its disadvantages as compared with chloroform, which are, as a rule, however, more than compensated for by its **greater safety**.

1. The stage of stimulation is more protracted, and there is more struggling.

To overcome this objection, anæsthesia is often induced in the first instance by nitrous oxide gas, passing on to ether when the patient is well under.

2. The anæsthesia is shorter and the degree less profound.

3. Ether vapour is an irritant to the respiratory mucous membrane.

So that, as mentioned above, it is sometimes contra-indicated.

Ether also causes sufficient swelling and congestion of the tongue and mucous membrane to at times impede the operator.

4. It is more disagreeable to take, and the taste is apt to hang about the patient for some days.

5. Ether vapour is very inflammable, and must not be used in proximity to a flame.

6. Ether must be given nearly pure (about 70% vapour to 30% of air).

Chloroformum. CHLOROFORM. CHCl_3 .

Materia Medica.

Synonym. Trichlormethane.

Composition. Usually sold mixed with 1% alcohol to preserve it from decomposing.

Solubility.

1 in 200 of water,
10 „ 7 „ alcohol,
Freely in ether or olive oil.

Preparations. *Spiritus Chloroformi* (ehlorieether),
1 in 20.

Dose. 5 to 20 mins.

Aqua Chloroformi, 1-400.

Dose. *Ad lib.*

Pharmacology. GENERAL ANÆSTHETIC; (applied externally) COUNTER-IRRITANT; (taken by the mouth) STOMACHIC; FLAVOURING AGENT; a SOLVENT of various substances.

Pharmacology and Therapeutics.

GENERAL ANÆSTHETIC. The phenomena of chloroform anæsthesia are similar to those described under ether (see p. 201). Chloroform should preferably be given by the dosimetric method, and the strength of vapour not allowed to exceed 2% of chloroform. The stimulation stage is less protracted. Chloroform may be preferred to ether for prolonged operations where the latter drug is contra-indicated (see p. 202), but has a much greater depressant effect on the heart and medullary centres.

The two drugs are sometimes given in combination, a mixture of alcohol, chloroform, and ether (*A.C.E. mixture*) being employed.

Death from ehloroform administration is unfortunately too common, the risks described above being especially pronounced. (See "*Dangers of Anæsthetics*," p. 196 *et seq.*)

A quite disproportionately large number of fatalities have arisen in the course of dental practice, and it may be said that chloroform should *never* be employed to anæsthetise patients for extraction of teeth, save in cases of most extreme emergency.

It must then be administered with the patient in a recumbent position (on no account sitting in a dental chair in the ordinary way), and only by a properly qualified medical man. These precautions must also be taken if it be used as a means of relaxing muscular spasm, in reducing dislocation or setting fractures of the jaw.

Aethyl Chloridum. See p. 116. Not official.

Pharmacology.

LOCAL ANÆSTHETIC (refrigerant) ; GENERAL ANÆSTHETIC.

Ethyl chloride (C_2H_5Cl) is a colourless, very mobile liquid ; it boils at $55^{\circ} F.$ Its density is 0.92 at $0^{\circ} C.$, but that of its vapour, taking air as unity, is 2.3. As usually put up, the drug keeps well in a dark, cool place. It has an agreeable smell, and on inhaling a few breaths, a pleasant feeling of exhilaration is experienced, rapidly followed by a sense of tingling and numbness with diminished sensibility to pain (analgesia). Shortly after its first introduction as a general anæsthetic, it fell into disfavour, owing to deaths having occurred suddenly and unexpectedly in several instances during its administration. This seems to have been partly due to faulty methods of administration, and partly to the samples of the drug used being impure. Absolutely pure ethyl chloride can now be made, and this has again popularised the drug for producing general anæsthesia. The ethyl chloride used for freezing must not be employed for this purpose. Ethyl chloride is still potentially a very lethal anæsthetic, acting with extreme rapidity when given in a closed inhaler, and producing a very profound degree of anæsthesia ; it is also rapidly eliminated, and the patient's recovery is in consequence also rapid. It requires the greatest care in administration, and if so given, in skilled hands, is relatively safe when only small doses are exhibited. Several deaths have, however, been reported since its reintroduction. The advantages of ethyl chloride are that it is portable, convenient and easy of administration, the anæsthesia produced by its inhalation is attended with no cyanosis or engorgement of the tongue, the respiration is quiet, and there is freedom from struggling and jactitation. It is particularly useful for children under the age of ten years, with whom it is very difficult to obtain a nitrous oxide

anæsthesia of sufficient length for practical purposes. The anæsthesia produced by a single average dose of ethyl chloride lasts from one to three minutes.

The disadvantages are that unpleasant after-effects are very much more common and severe than after nitrous oxide gas—sickness, headache, and collapse being the commonest sequelæ.

The preparation of the patient.—The best time to administer ethyl chloride in dental practice is not less than three hours after a meal—that is, for instance, shortly before the mid-day meal, the patient being instructed to take a light breakfast at his usual hour. He should also be told to take a purgative the second night before the operation, for in this way the bowels will be at rest at the hour of appointment. This is a better plan than that usually adopted in surgical practice, whereby the patient is already depleted by the free purgation—sometimes to a serious extent. His bowels are not at rest at the hour of appointment, and their existing irritability is increased by nervousness, especially if he be kept waiting; in result, they may act during the operation. All clothing must be loosened, particularly the corset, for the earlier stages of anæsthesia are marked by exaggerated breathing, all the muscles of ordinary respiration being brought into play; but in the later stages the thoracic muscles of respiration participate in the general muscular paralysis, and the respiration is carried on by diaphragmatic action alone. Ethyl chloride should, therefore, not be given when there is great abdominal distension.

Administration.—Ethyl chloride is best administered in a closed inhaler, the modified Ormsby's ether inhaler or Dr. McCardie's inhaler being the best, on account of their wide bore, since with them no obstruction is offered to the respiration. If, also, the sponge be properly adjusted, it acts as a screen, and prevents too concentrated a vapour being presented to the patient. Most inhalers at present on

the market ignore these two points, and are therefore faulty, because in them the ethyl chloride is suddenly volatilised, and the patient thus gets the full strength of the pungent vapour, which, when concentrated, is unpleasant and apt to take the breath away, even when only small quantities are sprayed in. For this reason all inhalers in which the principle is to spray the drug upon a piece of lint or similar material fixed in the face-piece are bad. Patients should be properly prepared before an administration of ethyl chloride, and may then, without undue danger, be anæsthetised in the sitting posture. The average dose for an average adult is 5 c.c. applied for from 20 to 60 seconds; that for a child is 3 c.c. applied for 15 to 40 seconds.

The signs of anæsthesia are usually, in order of their appearance, deep, stertorous breathing, fixity of the globes of the eyes, dilated pupils, and, finally, loss of ocular reflexes.

It must be remembered, however, that variations from this rule are not uncommon, and the closest watch must be kept upon the effect of the anæsthetic.

The after-effects vary in direct relation to the duration of the administration and the previous preparation of the patient; that is to say, if too small a dose be placed in the inhaler, it will be necessary to keep the inhaler applied for an unnecessarily long time in order to produce anæsthesia, and in consequence of this limitation of oxygen and rebreathing of expired gases, faintness, collapse, vomiting, and headache are frequently met with. The headache does not begin immediately, but comes on an hour or more after the operation, and often lasts several hours.

It is better practice, therefore, to place an ample dose in the inhaler; anæsthesia is then very rapidly induced, and the minimum of rebreathing allowed, the administration being then rarely followed by unpleasant after-effects.

After-treatment.—Patients are more likely to vomit if they are hurried from the dental chair. It is better to allow them to remain in the recumbent position for at least fifteen minutes after the administration, if this time can be spared, the chair being tilted back meanwhile. In half an hour they will appreciate and benefit by a cup of weak tea, without milk, but with a thin slice of lemon ; or, if preferred, a cup of bovril, beef tea, or *consommé*, flavoured with pepper and a little salt, but without toast or other solid food. In two hours subsequently they will be ready for a hearty meal.

Ethyl chloride has but a limited field of usefulness in dental surgery, and is unlikely ever to replace nitrous oxide gas. It is most useful for operations of two or three minutes' duration, when an ordinary simple administration of gas would not give enough time, in those cases where there is much swelling and spasm of the jaw, from alveolar abscess or other inflammatory trouble. On account of the greater frequency of after-effects, and its more lethal power, it should not be given for ordinary simple operations where an ordinary simple administration of "gas" will suffice. For operations also lasting more than three minutes, it is better to give nitrous oxide by the continuous method of administration by means of the nasal tube, or follow the gas by ether. The after-effects from ether are much the same as from ethyl chloride, but the former is a safer anæsthetic.

The treatment of dangerous symptoms arising during an administration of ethyl chloride. Ethyl chloride kills by paralysing the respiration, with the chest fixed in a position of over-distension ; the heart fails immediately afterwards, but cases are on record in which the patient has died from heart failure immediately after the operation. The treatment, therefore, of dangerous symptoms should be directed to **restoring respiration**, and these will indirectly stimulate the heart. The first consideration is to see

that the air-way is perfectly free ; then exert rhythmic traction upon the tongue, and if this be unsuccessful, begin artificial respiration, giving oxygen gas meanwhile if this be at hand. Owing to the over-distended and fixed condition of the chest, it is necessary first to endeavour to empty the lungs. This is best accomplished by careful pressure upwards through the abdominal wall through the diaphragm, and gentle compression of the lower ribs ; Sylvester's method of artificial respiration will then be possible. Weak ammonia vapour may be held to the nostrils, but nitrite of amyl is useless. Faradism may be tried, and the chest flicked with a wet towel, or suddenly douched with cold water. Hypodermic injections of strychnine, ether or brandy are not likely to be of the least avail in restoring the respiration, and it is better not to waste time in trying them. Of course, if there be any obstruction to the air-way, and this cannot be removed, tracheotomy must be performed immediately. When artificial respiration has been effectually begun, the usual measures of stimulating the heart may be employed. As, however, ethyl chloride is eliminated very rapidly, the patient quickly recovers when the respiration has once been established, but if the pulse be flagging, and the patient remain moribund, he must be kept warm and heart stimulants resorted to.

Soemnoform. This is a proprietary preparation of ethyl chloride, of which it contains 65% with the addition of 30% of methyl chloride and 5% of ethyl bromide. It has no advantage over pure ethyl chloride, but, on the other hand, is unpleasant to inhale, and is far more likely to be followed by more severe after-effects of longer duration. Intense headache coming on two or three hours after the administration, and lasting sometimes into the next day, is common after a full dose of Soemnoform, although the patient may leave the surgery comparatively well and express satisfaction with the anæsthetic. When better results are obtained with an ordinary well-known drug, we think it undesirable to use a proprietary preparation.

APPENDIX.

FILLING MATERIALS.

The ideal filling material should be—

Hard, tough, and non-porous.

Insoluble in the fluids of the mouth.

Adhesive.

Constant in shape and size. (Non-warping and non-shrinking.)

Non-conducting.

Non-irritating.

Easily adaptable.

A good colour and translucent.

The fillings produced by each material will be compared with this as practically as the brevity of this chapter will permit, the subject being far too large for full and detailed exposition here.

Gold.

1. Cohesive.

2. Non-cohesive.

Cohesive gold.**COMPOSITION.**

Chemically pure gold.

Gold is soluble in mercury, and care must be exercised in placing amalgams in combination with gold.

PREPARATION.

The pure gold may be hammered out into thin foil, each 4 sq. inches, weighing 4 grs., and known as No. 4 ; or heavier foils, ranging from No. 4 to No. 60, may be used. The foil may be hammered out still finer, and rolled into cylinders or rope. Or the gold may be dissolved and redeposited in the form of feathery masses, known as mat gold, or "crystal gold."

PROPERTIES.

Pure gold in thin strips can be cold-welded by a pressure that is insufficient to damage moderately strong cavity walls.

Cohesive gold produces a filling which is—

Hard, tough, and non-porous.

Hard enough to withstand the force of mastication when resting on a broad base. It is the toughest of filling materials, and thin edges may be trusted to remain in place. The porosity of gold fillings depends mainly on imperfection of manipulation, and to a less extent on insufficient condensing. It does not seem possible to make an absolutely non-porous gold filling in the mouth, but they can be made practically non-porous.

Insoluble.

Not adhesive.

Constant in shape and size.

An interstitial filling exposed to a heavy biting strain, and not well supported by a sufficiently broad base, will in time be bent away from the tooth wall and leak.

Highly conducting.

Non-irritating.

Difficult to adapt.

Of a bright, clean, yellow colour, and opaque.

Foil is the most generally useful form, and capable of the most exact and delicate manipulation. Cylinders and rope are less liable to rock when starting a cavity, but more difficult to adapt exactly to the edges and recesses. Mat gold is the least liable to rock, but the most difficult with which to form a tough, non-porous, and exact fitting plug.

Non-cohesive gold.

COMPOSITION.

Pure gold.

PREPARATION.

Non-cohesive gold is only prepared in the form of foil (No. 4) and cylinders or rope. It is pure gold, the surface of which has been exposed to the action of some gases and has lost its cohesive property. There is a great difference in the softness of different makes.

PROPERTIES.

Non-cohesive gold produces a filling which is—

Hard, tough, non-porous.

Non-cohesive or "soft gold" can, by proper condensation, be made to produce a filling quite capable of withstanding mastication. The gold, being all in separate pieces, must be well supported, or the pieces will be driven apart; and in this sense it is not tough, but the edges are not brittle, and, if properly constructed, will not fray.

Insoluble.

Non-adhesive.

Constant in shape and size.

The absence of cohesion must be remembered, and the filling not exposed to a force tending to drag the portions of the gold over each other in the direction of their long axis.

Highly conducting.

But not so highly as cohesive gold.

Non-irritating.

Difficult of adaptation.

Of a bright, clean, yellow colour, and opaque.

Tin.

COMPOSITION.

Pure tin.

PREPARATION.

Pure tin hammered out to form No. 4 foil, or foil rolled into cylinders.

PROPERTIES.

Hard, tough, non-porous.

Insoluble.

Non-adhesive.

Constant in shape and size.

Highly conducting.

Non-irritating.

Difficult of adaptation.

Black and opaque.

Amalgams.

There are very many amalgams in use, but it is only proposed to deal with three here, viz.,

A silver-tin amalgam, having a formula of

Silver	68·5
Tin	24·5
Gold	5
Zinc	1

A copper amalgam (Sullivan or Rogers), composed of
Copper and mercury.

And palladium amalgam, composed of
Palladium and mercury.

The last two are of little use, but the former is a representative of a most important class of filling materials, made up of a basis of silver and tin in the proportions of about 7 to 3, to which various other metals have been added in small quantities. The various metals suggested are—

Gold, platinum, copper, bismuth, and zinc.

The exact effects which these have on the mixture are very differently stated by different writers.

For the full description of the many interesting and practically important points about amalgams, other works must be consulted, as they are rather outside the scope of this book, and too complex to be reduced into brief notes.

Silver-tin amalgam.

PREPARATION of a silver-tin amalgam.

The ingredients, which must be pure, are weighed out, and then melted together, melting the most fusible first, and adding the others in the order of their fusibility, so as to employ as little heat as possible. During the fusion the metals should be well protected from the air to prevent oxidation. The ingot is then reduced to filings, and "annealed" or "aged" by heating it gently (130° F.) for a few days.

PROPERTIES.

Hard, fairly tough, and non-porous.

The edge strength of amalgams is much below that of gold, and thin edges of fillings are not permissible with this material.

Insoluble.

Non-adhesive.

Constant in shape and size.

Fillings made with an unequal distribution of mercury will warp. Thin edges warp and get chipped. Heavy masticating stress will cause an insufficiently supported filling to "flow" away from the tooth wall. There are some slight alterations in setting, and crystallisation of the surface occurs after setting, but within such small limits that practically a sound filling can be made.

Conducting.

Non-irritating.

Easily adaptable.

Of a light grey colour and opaque.

The granular (crystalline) surface of an amalgam may, after a few days, be polished to a bright silvery surface, which can be kept bright by the patient. Amalgam will show dark through a thin layer of enamel and dentine.

Copper amalgam.

PREPARATION.

Sheets of iron or zinc are immersed in a saturated solution of copper sulphate, the precipitated copper is scraped from the plates and washed with water or dilute sulphuric acid. It is then placed in a mortar with six times its weight of mercury, and thoroughly mixed and washed until the washings come away colourless. Then it is squeezed in wash-leather to get rid of the excess of mercury, divided into small pieces, and allowed to set.

PROPERTIES.

Not very hard, fairly tough, non-porous.

Copper amalgam wears away under mastication, but the thin edges thus formed do not curl up or chip.

Soluble.

Copper amalgams differ very much in this respect, and the exact causes of the dissolution are not known, but all copper amalgams gradually wash away, and some very rapidly.

Non-adhesive.**Constant in shape and size.**

The wearing and dissolving excepted.

Conducting.**Non-irritating.****Easily adaptable.****Black and opaque.**

Copper amalgams not only turn quite black, but they also stain the tooth either black or green, the stain being probably copper acetate.

The hardening and disinfecting properties of, and mercurial poisoning from, copper amalgams are mythical.

As copper amalgams continue to give off minute quantities of mercury during the disintegration, gold clasps must not be fitted round teeth containing these fillings. Copper amalgam is very variable in its lasting properties.

Palladium amalgam.**PREPARATION AND COMPOSITION.**

Pure palladium is mixed with mercury at the time of using, and very quickly sets.

PROPERTIES.

Hard, tough, non-porous.

Insoluble.

Non-adhesive.

Expands whilst setting.

Conducting.

Non-irritating.

Difficult to adapt.

Black and opaque.

It does not stain the teeth.

Its rate of setting is so great, and so much heat is generated, that it is not of much practical use.

Osteo-Plastics.

1. Oxy-chloride of zinc.
2. Oxy-phosphate of zinc.
3. Oxy-sulphate of zinc.

Oxy-chloride of zinc.

COMPOSITION.

The powder consists of oxide of zinc, to which may be added colouring material, powdered glass, silica, borax.

The fluid is a solution of zinc chloride.

PREPARATION.

Very little is really known of the actual preparation of the osteo-plastics, the various processes being trade secrets. The mere mixing of the pure ingredients as we know them does not produce a satisfactory filling material.

PROPERTIES.

Moderately hard and tough, porous.

Oxy-chloride is harder than oxy-phosphate, but it wears out under the force of mastication.

Soluble.

Oxy-chloride is even more soluble than oxy-phosphate.

Adhesive.

Constant in form and shape.

Non-conducting.

Irritant.

Easily adapted.

Good colour, but opaque.

Oxy-chloride fillings contain a certain amount of free zinc chloride, which is a caustic and disinfectant, so that these fillings have a caustic and disinfectant effect on the dentine. Oxy-chloride can be mixed much more fluid than oxy-phosphate, and will yet set hard.

Oxy-phosphate.**COMPOSITION.**

The powder consists of oxide of zinc, to which may be added colouring matter, silica, aluminium phosphate, borax.

The fluid is orthophosphoric acid, to which glycerine is at times added.

PREPARATION.

Not accurately known.

PROPERTIES.

Moderately hard and tough, porous.

Oxy-phosphate is not so hard as oxy-chloride; it wears away under ordinary mastication; different makes and different mixes vary as to porosity.

Soluble.

Oxy-phosphate is less soluble than the oxy-chloride, but varies very widely in different cases.

Adhesive.

Constant in shape and size.

Non-conducting.

Slightly irritating.

Due principally to the free phosphoric acid.

Easily adapted.

Good colour, but opaque.

Oxy-sulphate. (Fletcher's artificial dentine.)

COMPOSITION.

The powder consists of zinc sulphate 1 part and zinc oxide 2 parts, calcined. The fluid is composed of a solution of 15 grs. of gum to the ounce of water, to which 1 gr. of sulphide of lime is added, and the whole filtered.

PROPERTIES.

Soft, friable, and porous.

Soluble.

Slightly adhesive.

Constant in shape and size.

Non-conducting.

Non-irritating.

Easily adaptable.

White.

This substance is only intended as a temporary filling or a lining material, and is a most excellent preparation. It lends itself well to medication, a mixture containing 10% of carbolic acid appearing to set firmer than the ordinary preparation.

Oxy-phosphate of Copper.**PROPERTIES.**

Moderately hard and tough, porous.

Soluble.

Adhesive.

Constant in shape and size.

Non-conducting.

Non-irritant.

Easily adaptable.

Black.

Silicate Fillings.**COMPOSITION.**

Aluminium, silica, beryllium, lime, kaolin, and zinc, combined with phosphoric acid.

In different makes different compounds are used and differently distributed between the powder and the fluid.

PROPERTIES.

Hard, fairly tough, non-porous.

Slightly soluble.

Slightly adhesive.

Constant in shape and size.

Non-conducting.

Non-irritant. Some contain arsenic as an impurity.

Moderately easily adaptable.

Good colour and translucency.

Gutta-Percha.**COMPOSITION.**

Many different makes of gutta-percha fillings exist, containing, in addition to crude gutta-percha,

which is itself a mixture of gutta and resins, various hardening materials, such as oxide of zinc, lime, silica, and kaolin in proportions varying from 15 to 80%. W. Rushton recommends :—

Pure gutta (freed from resins)	50 parts.
Finely levigated silica	30 parts.
Oxide of zinc	20 parts.

PREPARATION.

Spirit is added to a solution of gutta-percha, which dissolves out the resins and preecipitates the gutta. The gutta is heated, and the powders gradually and thoroughly mixed with it.

PROPERTIES.

Soft, tough, non-porous.

Gutta-percha is not hard enough to bear the force of mastication, but yields and is soon bitten out of shape if exposed to the bite.

Insoluble.

Adhesive.

Gutta-percha prepared as above is not very adhesive. The adhesion may be increased by moistening the surface with *eucalyptus* or *cajuput oil* and heating.

Constant in shape and size.

Gutta-percha sometimes swells in the mouth, and if exposed to mastication is readily driven out of place.

Non-conducting.

Non-irritating.

Easily adaptable.

Of a good colour, but opaque.

Porcelain.

COMPOSITION.

Porcelain of varying degrees of fusibility, the variation being obtained by altering the proportions of the felspar, silica and kaolin.

PROPERTIES.

Hard, brittle, non-porous.

Insoluble.

Non-adhesive.

Constant in shape and size.

Non-conducting.

Non-irritating.

Difficult to adapt.

Good colour and surface.

Inasmuch as porcelain fillings are fixed by cement, they necessarily share the characteristics of the latter material.

Gum Resins. See p. 129.

Are but temporary fillings.

Gum sandarac, mastic, or dammar dissolved in *alcohol* to form a solution about the consistency of thin treacle, or *gum copal*, similarly dissolved in *ether*, when mixed with cotton-wool, form a water-tight dressing which will endure for a few days. The addition of hydronaphthol is beneficial. (See p. 90.)

Friar's Balsam.

THE CLEANSING OF THE MOUTH.

A healthy mouth is maintained in a clean state by :—

A. Natural Methods.

The natural methods of cleansing are the most important in natural mouths, or where natural conditions can be approximately re-established. They consist of :—

- (a) The scouring action of mastication ;
- (b) The scavenging action of the tongue, lips and cheeks between meals ;
- (c) The flushing, solvent and amylolytic action of the saliva ;
- (d) The solvent action of bacteria.

The vigorous and free mastication of food, especially fibrous food, scours the teeth, and thus fully functional teeth are always cleaner than those which are not used at all or only very guardedly used. A natural mouth will be found to be quite free from food *débris* half an hour after a meal (Breese), but in many mouths, even when free from caries or pronounced pyorrhœa, *débris* is found to lodge. This *débris* appears to consist of particles of the last food taken, earlier deposits being forced out to make way for it, so that by finishing meals with a fibrous and “alkali potential” food the risk of caries can be much reduced.

The action of the tongue, lips, and cheeks when not obstructed by bridges or dentures will, almost automatically, remove all accessible particles of food after a meal, and their activity in speaking helps to prevent stagnation about the teeth. When the lips and tongue are used to prevent cold or irritant food from coming in contact with tender parts of the teeth, the fermentation around and tenderness of such

teeth is greatly increased. If the lips do not cover the teeth, as in mouth-breathing, then the surface of the teeth and gums soon become covered with a half-dry film of saliva and mucus to which any dirt particles in the air will readily and firmly stick, and a very uncleanly condition results. When from any cause, such as paralysis or loss of tactile sensation, the lips are inactive, then food will collect in the vestibulum oris.

The quantity and quality of the saliva are of very great importance to the health and cleanliness of the mouth. The quantity can be naturally influenced to some extent by selection of diet, especially the food taken at the end of meals; fruit is very useful for this purpose. The saliva lubricates the mouth and food, and dissolves many foods by the aid of its water and ptyalin, and thus rinses the mouth clean.

Some particles that are not soluble in the saliva, such as meat, may be dissolved by the action of the bacteria and so eventually removed.

It is important that the artificial methods of cleansing the mouth shall not check the natural processes, and any cause which hinders such cleaning, such as carious and tender teeth, irregular positions of the teeth, mouth-breathing, artificial teeth, or swollen gums, should be rendered as little harmful as possible.

B. Artificial Methods.

In cleansing the mouth artificially use is made of both—

1. Mechanical Methods.

2. Chemical Methods.

The latter including :—

SOLVENTS, ANTISEPTICS, ANTACIDS.

The greater importance in our present state of knowledge belongs to the **mechanical** method.

The various means used for this purpose are **tooth-brushes, tooth-picks, silk, and canes**, used with

or without the help of **tooth-powders**, **tooth-pastes**, **tooth-washes**.

The **chemical** method is only an adjuvant to the mechanical, assisting or supplementing its action. The various means employed are **tooth-powders**, **tooth-pastes**, **tooth-washes**, and **mouth-washes**.

1. Mechanical Methods.

The Tooth-Brush.

Great variety of opinion exists as to what kind and shape of brush to use. The **function** of the brush is to mechanically scrape the teeth and gums. If it is made hard enough to remove all the material that may be found adhering to the surface of dirty teeth, it will be hard enough to scratch the gums, and even the teeth, harmfully, especially if used vigorously in conjunction with powder.

If it be made very soft (badger's hair), it will not be able to remove the *débris* from the teeth, unless very frequently employed.

Moreover, it must be obvious that, however stiff and well arranged the bristles may be, they will not penetrate between a normally arranged set of teeth. Thus the weakest point remains uncleaned.

We would therefore advocate that the teeth be first thoroughly cleansed by the dentist, when a **medium soft** brush is sufficient to keep the surfaces free from *débris* and calculus, if it is used carefully and thoroughly twice a day.

The finer bristles—of a soft brush—will penetrate better than the stouter hard ones, and the amount of friction to the gums will be a healthy stimulus rather than a laceration.

The brush should be **small** enough to enable it to be freely moved about and around the teeth.

It is very doubtful whether any eccentric arrangement of the bristles, as to length and position, will practically procure deeper penetration between the teeth than the ordinary arrangement.

The brush should be used both with a horizontal movement over the buccal and labial aspects of the teeth and gums, as this cleans the exposed cervical margins and sulci well; also with a vertical movement, directed chiefly downwards on the upper teeth and upwards on the lower teeth, in order to brush out *débris* from between the teeth. The lingual aspects of the teeth can only be reached with a more or less vertical movement, the occlusal surfaces with a horizontal motion.

The tooth-brush is liable to become very septic and infective from use, and is very difficult to sterilise by any means that will not damage the bristles; also no antiseptic tooth powders, pastes or washes have any useful disinfectant action on the brush. Rinsing the brush in a 1% solution of tricresol immediately after use is effective. Even an aseptic brush can produce great injury in a septic mouth by causing abrasions of the soft gums and forcing septic matter into the wounds.

A tooth-pick is a very useful and, in some cases where the interdental spaces are irregular, necessary means for cleansing between the teeth. It should be small, pliable, pointed at one end and rounded and flatter at the other, made of quill or very thin celluloid.

Metal tooth-picks are to be avoided, because they are too thick to penetrate, too stiff to fit, and are sharp and hard enough to damage teeth and fillings. They are also too expensive to throw away after using.

Silk is a very effectual means of cleansing between the teeth, but few patients will take the trouble which its use involves.

Silk must be used with care and skill to avoid injury to the delicate tongues of gum between the teeth and to effectually cleanse the whole of the mesial surfaces of the teeth.

Dipping the silk in a strong and lasting disinfectant, such as 1 to 100 HgCl₂, may help to prevent fermentation.

A cane cut to a flattened point at one end and frayed out to form a brush at the other is, if diligently used, a very good all-round instrument for cleansing the teeth.

Tooth-Powders.

Tooth-powders are not desirable if the mouth is clean to begin with and carefully brushed twice a day.

They are also at times harmful by causing abrasion of the teeth, and by packing in between the teeth they irritate the gum, help to form tartar, and a nidus for fermentation.

Yet as human effort is not always perfect, it is often advisable to **increase the scouring action** of the brush by using some powder on it.

Chalk is usually sufficiently detergent. Pumice, powdered shell, or palpable grit, are not permissible for use by the patient himself. A small proportion of *soap* in the form of powder greatly assists in cleansing the teeth.

The insoluble nature of chalk is to be regretted; but such substitutes as magnesia are unpopular on account of their taste and liability to cake. Charcoal in any form is contra-indicated for fear of tattooing the gum.

Flavouring and perfuming agents, such as *otto of roses*, *eucalyptol*, *saccharine*, *acid tartarate of potassium*, *menthol*, or *essential oils*, are of considerable value for their sialogogue action, especially when added to soapy or alkaline dentifrices.

As regards disinfectants, it is not possible to introduce any drug in sufficient quantity and strength to be of practical service in the short time during which powder remains on the teeth.

Thus :—

For occasional use in cleanly mouths.

Rx.

Cretae Precipitatae $\bar{z}$ ij.

Signa. The tooth-powder.

Or it may be flavoured thus :—

R.

<i>Pulveris Iridis</i>	gr. xxx.
<i>Olei Eucalypti</i>	m. ij.
<i>Cretae Precipitatae</i>	℥ j.
Misce.	
Signa. The tooth-powder.	

Where a soap dentifrice is required :—

R.

<i>Pulveris Saponis Duri</i>	
„ <i>Iridis</i>	āā. gr. xxx.
<i>Olei Caryophylli</i>	m. ij.
<i>Cretae Precipitatae</i>	℥ j.
Misce.	
Signa. The tooth-powder.	

Where more scouring action is required :—

R.

<i>Pulveris Saponis Duri</i>	
„ <i>Ossis Sepiae</i>	
„ <i>Iridis</i>	āā. gr. xxx.
<i>Olei Caryophylli</i>	m. ij.
<i>Cretae Precipitatae</i>	℥ j.
Misce.	
Signa. The tooth-powder.	

Where an alkaline dentifrice is required :—

R.

<i>Pulveris Iridis</i>	gr. xxx.
<i>Magnesii Carbonatis Ponderosae</i>	
<i>Cretae Precipitatae</i>	āā. ℥ iv.
Misce.	
Signa. The tooth-powder.	

Where an antiseptic dentifrice is required :—

R.

<i>Acidi Carbolici</i>	gr. xx.
<i>Cretae Precipitatae</i>	℥ j.
Misce.	
Signa. The tooth-powder.	

Where an oxygen dentrifice is required :—

R.

<i>Magnesium Peroxide</i>	10
<i>Hard Soap</i>	2.5
<i>Menthol</i>	.1
<i>Oil of Rose</i>	.25
„ „ <i>Winter-green</i>	.5
<i>Precipitated Chalk</i>	ad 100

Or, where a sweet dentifrice is required :—

R.

<i>Pulveris Potassii Chloratis</i>	
„ <i>Sodii Bicarbonatis</i>	āā. gr. xv.
„ <i>Iridis</i>	
„ <i>Saponis</i>	āā. gr. xxx.
„ <i>Glusidi</i>	gr. j.
<i>Olei Menthae Piperitae</i>	m. j.
„ <i>Gaultheriae</i>	m. ij.
<i>Cretae Precipitatae</i>	ʒ j.

Misce.

Signa. The tooth-powder.

Tooth-Pastes

Have the same disadvantages as powders, with the additional one that they are often compounded with a sugary (fermentable) base.

Tooth-Soap.

The use of soap on the tooth-brush aids in the solution of *débris* and calculus and increases the penetration of the bristles, and possibly by its lubricating action assists in the natural elimination of food particles. Beyond its anti-sialagogue action it can have no ill effect. Super-fatted soaps are preferable to alkaline soap.

2. Chemical Methods.

Mouth-washes

Enjoy great popularity, but the question as to how much of their beneficial effects is due to the accompanying **mechanical** cleaning, and how much to their **chemical** action, is an open one.

This much may be, however, clearly stated—that no mouth-wash will do any permanent good unless the mouth be properly cleaned.

No drug will cure inflammatory conditions by being merely swilled over the surface a few times a day. It would always be better if the mouth-wash were carefully **swabbed** over the affected part after proper previous cleaning; also in prescribing mouth-washes in the ordinary way their **rapid dilution and removal** by the saliva must be remembered, and the patient be instructed in the necessary duration of each application (see p. 65).

Mouth-washes are employed for a variety of purposes, and should be carefully adapted to the particular case under consideration.

The following actions and properties of mouth-washes may be usefully considered:—

1. Deodorising action.

The odour of the breath due to fermentation in the buccal cavity, or to tobacco smoke, may be at once cured by brushing the teeth and holding a weak solution (claret coloured) of *permanganate of potash* in the mouth for a minute or two. This is only a temporary remedy. A permanent cure can only be effected by a thorough removal of all *débris*, concretions, and carious dentine, and proper disinfection. An active gumboil, indigestion, bronchiectasis, or tonsilitic calculus may be the cause of the smell, and should be treated *secundum artem*.

2. Disinfectant action.

Thorough mechanical cleaning must first be employed in order to remove all fermentable material and allow free access of the drugs to all parts. This alone will very greatly reduce the number and variety of germs in the mouth.

Miller states that it is almost impossible to perfectly disinfect the mouth, but, after cleansing, the following drugs are efficient:—

<i>Perchloride of Mercury</i>	1 in 2500
<i>Salicylic or Benzoic acid</i>	1 in 200
<i>Listerine</i>	1 in 2

A mouth-wash to be efficient must penetrate fairly well and act in a minute.

3. Antiseptic action.

Antiseptic mouth-washes to be of any use must be very frequently employed. They do not destroy germs, and only prevent their growth until they are much diluted or removed by the saliva. They nevertheless seem to have a beneficial action in washing away, diluting, or neutralising the germs and their ptomaines, and by removing fermentable material, thus assisting the tissues to overcome the germs.

<i>Carbolic acid and liquor potassae</i>	1 in 250
<i>Permanganate of potash</i>	1 in 1000
<i>Listerine</i>	1 in 4
<i>Zinc chloride</i>	1 in 100
<i>Peroxide of hydrogen</i>	1 in 30
<i>Formaline</i>	1 in 1000

—are all thus employed.

4. Cleansing action.

The mechanical action of the mouth-wash is, perhaps, its most valuable property. Solutions con-

taining *soap* or *liquor potassae* are very useful in removing mucus and dead epithelium, and thus allowing other drugs and the tissues to act at greater advantage. The brush should be used in conjunction with it.

5. Stimulant and irritant action.

A slight amount of irritation, or stimulation, by increasing the activity of the circulation, may hasten the recovery of chronically inflamed tissues; if long continued, or at all intense, it will do more harm than good. *Pyrethrum*, *alcohol*, and the *essential oils* are useful in this connection.

The use of strong irritants destroys the tissues, produces a mass of dead tissue or lymph favourable for the growth of germs, and prevents the process of normal repair. This action may far exceed any useful disinfectant or styptic action the drug may possess.

A stimulant action on the mouth will have a beneficial effect on digestion.

6. Astringent action.

A swollen and lax condition of the gums, usually accompanied by hyperæmia and an excessive secretion of mucus, is very favourable to the growth of germs and spread of caries. Frequent applications of astringent lotions are of decided value in the relief of this condition. The various preparations containing *tannin*, *copper sulphate*, *alcohol*, *myrrh*, etc., may be employed.

7. Antacid action.

The best ways of maintaining an alkaline reaction in the mouth are by the prevention of fermentation,

the removal of mucus, and stimulation of the salivary flow. Direct antacids, such as *liquor potassae*, *sodium bicarbonate*, and *magnesia hydrocarbonate*, are of temporary use.

The alkalinity produced by drugs disappears as soon as the saliva has washed them away. This period of alkalinity has been stated to appreciably favour the development of harmful bacteria.

8. Anodyne action.

For the relief of pain and tenderness it is best to direct our efforts to removing the cause of the discomfort and to assisting the tissues to recover. Anodyne drugs should only be temporary remedies. *Cocaine*, *opium*, and *carbolic acid* are useful, but must not be thoughtlessly employed.

The **temperature** of the mouth-wash may be of great comfort. No anodyne may be used that will hinder the healthy healing of the wound.

9. Sialagogue action.

It is said that the very best mouth-wash is the natural saliva, and drugs that increase the flow and alkalinity of the saliva for a period of a quarter of an hour or more will probably do much more good than drugs which are only applied for a brief period. Drugs that decrease the flow or alkalinity of the saliva may do more harm than good. *Citric* and *tartaric acids* and *saccharine* are useful.

10. Demulcent or protective action.

In raw and tender conditions of the mouth a protective and soothing glutinous application is useful. Acidly fermentable substances are to be avoided, and it must be remembered that taste and the activity of other drugs will be reduced. It is on account of the

demulcent properties of *gums* and *resins* that natural preparations of drugs are more kindly in their actions than the pure (dilute) alkaloids, etc. *Glycerine* and *tragacanth* may be useful.

11. Taste, smell, and appearance

Should all be considered and made as pleasant as possible. *Chloroform*, *menthol*, *eucalyptus*, *eau de Cologne*, *krameria*, and *cochineal* are all of use.

12. Poisonous action.

It is undesirable to employ substances which, if swallowed, would be liable to produce constitutional derangements. For example, *opium*, *perchloride of mercury*, *cocaine*, and *belladonna*.

DRUGS WHICH, APPLIED LOCALLY OR ADMINISTERED INTERNALLY, HARMFULLY AFFECT THE TEETH AND ASSOCIATED STRUCTURES.

Applied locally.

Acids.

Very dilute solutions of weak acids, if applied continuously, do appreciably destroy the enamel. In the mouth, acid drinks (cider, lemonade), gargles (alun), medicines (dilute acids), or foods (fruits) are not applied continuously, but very intermittently, and in the case of fluids mostly to the exposed surfaces; hence little harm is to be expected unless the application is very frequent.

The acids which produce decay are produced in particles of food wedged in between the teeth, or in the meshes of the "gelatinous plaques" which adhere to the teeth, and so are continuously applied. Alkali workers, who are exposed to acid fumes, and the dwellers in cider districts suffer from bad teeth, presumably due to the decalcifying action of these acids.

Acid washes or applications to remove tartar, enlarge a root-canal, or in the process of bleaching most certainly also decalcify enamel.

Grit.

The use of hard, sharp, powdered substances in tooth-powders, such as powdered shell, diatoms, and pumice, when regularly applied, will wear away the teeth and also drive back the gum. Insoluble powders, especially alkaline ones, and powders mixed with

sugary and sticky compounds, when used as tooth-powders or pastes, are apt to lodge in the crevices between the teeth and around their necks, thus forming calculi or tartar and so loosening the teeth ; or they form a nidus in which fermentation may go on, to the destruction of the teeth, thus doing harm indirectly. Charcoal as a tooth-powder is apt to tattoo the gum blue.

Stains.

It is hardly possible to stain enamel. Stains may lodge on its surface, especially if rough, and in the adherent film found on teeth, but they may all be removed by polishing, and the teeth kept free by constant careful brushing. The yellowing of teeth is due to changes in the dentine beneath the enamel, or to slowly acting acids. The exposed dentine or cementum may be much more readily affected, and may be stained black by *silver nitrate*, either green or black by *copper salts*, and green by *nickel salts* (from screw posts), and, according to some observers, by *mercurial salts* also. Iodine stains are transitory. The reddening effect of nascent oxygen on a recently darkened tooth is due to the oxidising action on the contained hæmoglobin, and will after a while turn to a yellow tint as degenerative changes occur. The use of arsenic in some cases appears to stain the root yellow, due to the formation of the yellow sulphide (As_2S_3).

Various articles of food, medicines containing iron or tannin, and the products of the action of chromogenic bacteria will stain dentine. Iron, either taken as a medicine or naturally in food, readily combines with the *tannin* contained in the food (*e.g.*, tea) to form black tannates, which stain the surface of the teeth ; this stain can be removed by proper brushing.

The very prevalent idea that *iron* damages the teeth is erroneous. Iron tonics are often prescribed with an acid adjuvant which will damage teeth, but the most harm is done by the anæmia, etc., for which the iron is given.

Caustics,

Such as *arsenious acid*, *caustic potash*, or *zinc chloride*, applied to, or allowed to escape on, the gum margin, and not quickly removed, will cause a septic inflammation and destruction of the tissues. *Phosphorus* entering the system through a dead tooth or pyorrhœa pocket will cause necrosis of the jaw by lowering the vitality of the tissues.

Irritants.

The long-continued use of such drugs as salicylic acid, benzoic acid, carbolic acid, salol and formaline in mouth-washes has been known to cause chronic inflammation in and about the mouth.

Taken internally.

Drugs taken internally, to harmfully affect the teeth themselves, must be taken during the growth of the teeth; the gums and periosteum, and so indirectly the teeth, may be affected at any time.

Mercury has been credited with causing the hypoplastic condition often seen in teeth. The evidence of this and the mode of its action is very obscure.

In favour of the view is the fact that children to whom mercury has been administered do sometimes have hypoplastic teeth, and the fact that we know the administration of mercury may cause inflammation of the gums, and therefore an abnormal condition in the immediate vicinity of the forming teeth.

Against the view, we know that many children to whom no mercury has been given have hypoplastic teeth, and many children to whom mercury has been given have not, and the period corresponding to the amount of hypoplasia is not a few days, but months, rather corresponding to periods of malnutrition than

the passing effect of a dose of medicine. Finally, there is a definite connection between the periods of hypoplasia and several general diseases, especially the exanthemata.

Mercury, lead, bismuth, silver or copper, administered at any time, is excreted partly by the oral mucous membrane, and if septic conditions are present, it will cause more or less inflammation, at times leading to necrosis of the jaw and loss of the teeth.

All these drugs are in part excreted from the mucous membrane, and *lead, antimony* and *bismuth* produce a blue or bluish-black line on the gums; *copper* may produce a greenish-blue line. These lines only occur round the teeth, and especially decayed or dirty teeth, and are apparently due to a precipitation of the metal in the tissue.

Silver stains all the tissues when administered for a prolonged period. In Addison's disease a delicate black line may appear on the gum.

A lead line must not be mistaken for the tattooing produced by the use of *charcoal* as a tooth-powder. The latter always occurs in particularly cleanly mouths and healthy people. In the former, the mouth is very foul and the patient anæmic. A lead line will in time disappear—about three months under proper treatment.

THERAPEUTIC INDEX.

In the following an attempt has been made to briefly indicate, opposite the diseases most commonly met with in dental practice, the most useful methods of treatment in each. Diseases of which the treatment is purely surgical are omitted; and where surgical treatment is used in conjunction with other means, or as an alternative, its application is indicated by the word **Surgical**.

Prev. Preventive or prophylactic treatment.

Rem. Remedial or curative treatment.

ABRASION OF TEETH.

Prev. Avoid tooth-powders and metal tooth-picks.
Dentures with clasps or wires to be carefully fitted.

ABSCCESS. See ALVEOLAR ABSCESS.

ACIDITY OF ORAL CAVITY.

Prev. Cleanliness, antiseptics (p. 64); treat diseases on which dependent.

Rem. Antacids (p. 93); sialagogues (p. 118).

ALVEOLAR ABSCESS.

Prev. Remove cause on which dependent; counter-irritants (p. 27); heat (p. 28).

Rem. Fomentations; surgical (*open and drain*).

After-treatment. Antiseptic mouth-washes.

ANÆMIA. General tonic measures (p. 149); purgatives (p. 140); Iron, Arsenic.

ANTRUM, Disease of. See INFLAMMATION, acute and chronic.

APHTHÆ. See THRUSH.

APHTHOUS STOMATITIS.

Rem. Cleanliness ; Glycerinum or Mel Boracis.

ARSENIC, Pain from application of.

Prev. Care in application (p. 15).

Rem. Phenacetin, Antipyrin, Iodine, Opium.

BLEACHING (p. 134).

CALCULUS.

Prev. Stop use of alkaline washes, tooth-powders, and pastes.

Rem. Surgical ; Bifluoride of Ammonium.

CANCER ORIS.

Rem. Surgical ; cauterise with strong nitric acid, stimulants (p. 159).

CARIES OF BONE.

Rem. Treat disease on which dependent ; surgical, antiseptics (p. 64), tonics (p. 149).

CARIES OF TEETH.

Prev. Cleanliness (p. 223), treatment of irregularities, treat constitutional disease, antacids (p. 93), antiseptics (p. 64) ; sialagogues (p. 118).

Rem. Surgical (*excision, filling*). Silver Nitrate, Alcohol.

CHANCER.

Rem. Black wash, iodoform (*locally*), mercurials, iodides, arsenic.

CHRONIC INFLAMMATION OF PULP. See PULP.

CHRONIC INFLAMMATION OF MUCOUS SURFACES.

Rem. Remove cause ; astringent mouth-wash or applications (p. 32), demulcents (p. 132).

DENTITION, DISORDERS OF FIRST.

Rem. Cleanliness. Glycerinum Boracis. General medical treatment.

DISCOLORATION OF ENAMEL.

Rem. Detergents.

DISCOLORATION OF DENTINE.

Prev. Surgical. Avoid staining agents.

Rem. Surgical, bleaching agents (p. 134), white fillings.

DRYNESS OF MOUTH. Demulcents, sialagogues (p. 118).

DYSPEPSIA. See ACIDITY.

EROSION.

Prev. As for ABRASION.

Rem. Alcohol, Tannin, Silver Nitrate. Surgical.

EXOSTOSIS.

Rem. Iodine (locally), salicylates, iodides (internally). Surgical.

FACIAL NEURALGIA. See NEURALGIA.

FEVER. See PYREXIA.

FOLLICULAR STOMATITIS.

Rem. Potassium chlorate; (*severe*) touch with Copper Sulphate or Silver Nitrate; purgatives (p. 140), tonics (p. 149).

FETOR OF BREATH.

Rem. Remove cause; deodorant mouth-wash (p. 64), Potassium Permanganate; sialagogues (p. 118).

FRACTURE OF JAW.

Rem. Surgical; antiseptic mouth-wash (p. 64).

GANGRENOUS STOMATITIS. See CANCRUM ORIS.

GINGIVITIS, ACUTE.

Rem. Fomentations, antiseptics (p. 64), local sedatives (p. 98), specifics (p. 167).

Surgical.

GINGIVITIS, CHRONIC.

Rem. Remove cause, astringents (p. 32), Tannin, Alcohol (*Eau de Cologne*).

GINGIVITIS, SCORBUTIC. See SCURVY.

GLANDS, LYMPHATIC, ACUTE INFLAMMATION OF.

Rem. Remove cause, fomentations, Belladonna and Glycerine liniment.

Surgical.

GLOSSITIS, CHRONIC SUPERFICIAL.

Rem. Demulcents (p. 118), caustics (p. 12).

GLOSSITIS, SYPHILITIC. See SYPHILIS.

GREEN STAIN.

Rem. Detergents (p. 128), Trichloroacetic Acid.

GUM, POLYPUS OF.

Rem. **Surgical.** Potassa cum Calce, Ethylate of Sodium.

GUM, RECESSION OF.

Prev. Soft brush, no powder, remove tartar.

Rem. Remove cause, massage (p. 33), stimulants (p. 32).

GUMS, SPONGY, AND INFLAMMATION OF. See GINGIVITIS.

HÆMOPHILIA, HÆMORRHAGE DUE TO.

Prev. Calcium Salts, Ergot.

Rem. **Surgical.** Styptics (p. 50), Suprarenal Extract, Ergot, Calcium Salts.

Also Plasma.

HÆMORRHAGE.

Rem. Surgical, heat and cold (p. 50), styptics (p. 50) (*as last resort*).

HYPERSENSITIVENESS OF DENTINE.

Rem. Dry thoroughly ; Oil of Cloves, Absolute Alcohol, Camphor, Menthol, Silver Nitrate, Zinc Chloride, Cocaine ionisation, Carbolic, Arsenic, Paraform ; protection, cold.

HYPERSENSITIVENESS OF PALATE AND FAUCES.

Rem. Inhalation of vapour of Spt. Camphor ; Cocaine spray, Carbolic (1 in 60 solution).

INFLAMMATION, ACUTE.

Rem. Remove cause, rest, heat or cold (p. 50), counter-irritants (p. 27) or local sedatives (p. 98). Surgical.

INFLAMMATION, CHRONIC.

Rem. Remove cause ; surgical, astringents (p. 32). local stimulants (p. 32) ; caustics (p. 12).

IRRITATION OF PULP.

Prev. As for caries : non-conducting fillings.

Rem. Surgical. Local sedatives (p. 98) ; Oil of Cloves.

LEUCOPLAKIA.

Demulcents (p. 122) ; antisyphilitic remedies (p. 174).

MERCURIAL STOMATITIS.

Surgical, antiseptics (p. 64) ; discontinue drug.

MEMBRANOUS STOMATITIS.

Copper Sulphate, Glycerinum Boracis.

MUCOUS TUBERCLES.

Rem. (*Locally.*) Black wash, astringents (p. 32) ; (*constitutional*) see SYPHILIS.

NAUSEA.

Rem. Sp. Camphor, Cocaine spray, Carbolic (1 in 60).

NECROSIS OF JAW.

Rem. **Surgical**, antiseptics (p. 64); tonics (p. 149).

NEURALGIA.

Rem. **Surgical**, local anodynes (p. 98), counter-irritants (p. 27), heat (p. 99); faradism, tonic treatment (p. 149), analgesics (p. 179), or general sedatives (p. 190).

ODONTALGIA.

Prev. As for caries, and causes. See ALVEOLAR ABSCESS, PULP INFLAMMATION AND IRRITATION, EXOSTOSIS.

Rem. Analgesics (p. 179), local anodynes (p. 98).

PAIN AFTER EXTRACTION.

Prev. **Surgical**.

Rem. **Surgical**. Warm mouth-wash. Carbolic (1 in 40) to socket.

PAIN FROM ERUPTING TEETH. **Surgical**, antiseptics (p. 64), astringents (p. 32).

PERIOSTITIS. (*Pericementitis*.)

Prev. Disinfect roots; **surgical**.

Rem. Heat, counter-irritants (p. 27), Aconite and Iodine, local sedatives (p. 98). **Surgical**.

PHAGÆDENIC ULCERATION. **Surgical**, caustics (p. 12), stimulants (p. 159).

PHOSPHORUS NECROSIS.

Prev. Fill carious teeth, cleanliness.

Rem. As for NECROSIS, tonics (p. 149), remove from cause.

POISONING, ACUTE. General principles of treatment.

1. *Remove* as much of poison as possible. Wash out stomach (except in case of corrosives). Emetics (see General Index).
2. Give *chemical* antidote where such exists.
3. Give *physiological* antidote.
4. *Treat symptoms* as they arise.

PTYALISM. See SALIVATION.

PULP, EXPOSURE OF.

Rem. **Surgical** (with local anæsthetic, p. 98). Devitalisation (see General Index), capping with Oxysulphate of Zinc combined with local sedatives (p. 98).

PULP, ACUTE OR CHRONIC INFLAMMATION OF.

Rem. Anæsthetise (p. 98) or Devitalise (p. 15). **Surgical.** (*Palliative*), Carbolic, Menthol, Morphine, Creosote, counter-irritants (p. 27), Phenacetin.

PULP, POLYPUS OF.

Rem. **Surgical**, Potassa cum Calce, Arsenic.

PYORRHŒA ALVEOLARIS.

Prev. Cleanliness, removal of calculus, avoidance of irritation by plates, etc., constitutional.

Rem. **Surgical**, Copper Sulphate, Aromatic Sulphuric Acid, astringents (p. 32), Ionic medication, Vaccines.

PYREXIA.

Rem. Remove cause, purgatives (p. 140), antipyretics (p. 179); (*severe*) application of cold.

RANULA. **Surgical**, iodine.

RECESSION OF GUM. See GUMS.

ROOTS, SEPTIC.

Rem. **Surgical**, Peroxide of Hydrogen, Peroxide of Sodium; dress with disinfectant (p. 64); Iodol, Beta-Naphthol, Ionic medication.

SALIVATION.

Rem. Remove cause, antisialagogues (p. 118).

SCURVY.

Prev. Supply of fresh vegetables, Succus Limonis.

Rem. Tonics, antiseptic mouth-wash (p. 64); astringents (p. 32); Succus Limonis.

SENSITIVE DENTINE. See HYPERSENSITIVENESS.

STAINING OF DENTINE. See DISCOLORATION.

STOMATITIS. See APHTHOUS, FOLLICULAR, PHAGE-DÆNIC, ULCERATIVE.

SUPPURATION LONG CONTINUED.

Rem. (*Local*) stimulants (p. 32), astringents (p. 32); (*constitutional*) tonics (p. 149).

SYNCOPE.

Rem. Recumbent position or lower head, stimulants (p. 159); Alcohol, Ether, Ammonia to nose, warmth, friction.

SYPHILIS.

Rem. Mercurials, Arsenic, iodides, tonics (p. 149), and local treatment.

TEETHING. See DENTITION DISORDERS, PAIN FROM ERUPTION.

TARTAR. See CALCULUS.

THRUSH (APHTHÆ).

Rem. Remove fungus by swabbing, Glycerinum or Mel Boracis; (*severe*), touch spots with Nitrate of Silver.

TONGUE, CHRONIC INFLAMMATION OF. See GLOSSITIS.

TONGUE, SIMPLE ULCERATION OF.

Rem. Remove cause, Chlorate of Potash mouth-wash, astringents (p. 32).

TONGUE, SYPHILITIC ULCERATION OF.

Rem. Antisymphilitic medicines (p. 174), iodides.

TRIGEMINAL NEURALGIA. See NEURALGIA.

TRISMUS, SPASMODIC.

Rem. Remove cause. (*Temporary*) general anæsthetic (p. 195).

ULCERATIVE STOMATITIS.

Rem. Cleanliness, remove cause of irritation, astringents (p. 32), Potassium Chlorate, antiseptics (p. 64), tonics (p. 149).

GENERAL INDEX.

The thick type denotes the principal notice of a drug, and where its Materia Medica and Toxicology will be found.

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